is issue: Thin Metal Drawing • Pantography • Shapers • Automatic Dies

DECEMBER • 1952

TOOLING and PRODUCTION

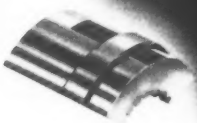
The Magazine of Manufacturing Management

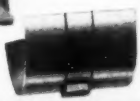
HARDINGE
ELMIRA, N.Y.

STANDARD EQUIPMENT
in
Progressive Screw Machine
Plants

Quick Change-over
saves $8.00 to $10.00
per set up

HARDINGE
le "S" Master Collets
and Pads
he only Master Collet
ith no Work Pressure
on the Screw





HARDINGE
Style "B" Master Feed Fingers
and Pads
Pads Cannot Work Loose
No Screws No Pins

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

Need [illegible] shapes and sizes of carbide?

We press or preform to your designs in CARMET

to save you expensive gri[illegible]

When the exact shape and size of Tip you need is not to be found in carbide producers' catalogs, what should you do?—(1) order the Tips that seem to be adaptable, and then go to the expense of grinding them down to size; or (2) ask CARMET to build you a die that presses the Tips to your designs! The answer is obvious! Save costly grinding.

[illegible] of the designs pictured [illegible] pressed or preformed by [illegible] quantity to the specifications of some individual customer. No excess metal to make for costly removal.

For [illegible] questions, call or write your nearest A-L representative today: [illegible] Allegheny Ludlum Steel Corporation, Carmet Dept., Wayne & [illegible], Detroit 20, Mich.

ATTENTION INDUSTRIAL DISTRIBUTORS

Ask us about handling CARMET standard seals and blanks in your area. Some territories are open. Write, phone or wire.

[illegible]

For complete MODERN [illegible], call

Allegheny Lud[illegible]m

AL FINE TOOL STEELS SINCE 1854

. . . Here's more work for your money—through effective cutting over full flute length. It's another Putnam feature that insures faster cutting, longer life. Over 1000 standard types and sizes available. See your Putnam distributor.

PUTNAM
TOOL COMPANY
2985 CHARLEVOIX AVENUE • DETROIT 7, MICHIGAN

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TOOLING and PRODUCTION

The Magazine of Manufacturing Management

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TOOLING and PRODUCTION is published monthly for plant operating and purchasing executives and department heads in 50 types of end product and contract manufacturing companies.

Every copy is directed to such an individual by name, by title, and by company gratis. See CCA certification.

These men, from whom emanate recommendations, requisitions and orders for needed materials, tools, equipment and accessories, comprise the Cycles of Buying Influence within their respective plants—CBI—and it is they who constitute TOOLING and PRODUCTION'S ever-vital reader circulation.

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Here are a few good reasons why Ex-Cell-O Drill Jig Bushings last longer and perform better:

1. Premium grade tool steel is selected for wear resistance and heat treated to 62-64 Rockwell "C".
2. Every bushing must measure up to Ex-Cell-O precision standards, as well as to A.S.A. standards.
3. High finish is ground on inside and outside diameters, and *under the head* for perfect bearing.

Take a tip from the country's largest users of drill jig bushings. Order from the convenient Ex-Cell-O Catalog.

To satisfy the needs of your purchasing and engineering departments be sure to have an adequate supply of Ex-Cell-O Bushing Catalog, Bulletin 35371. Ask for the copies you need.

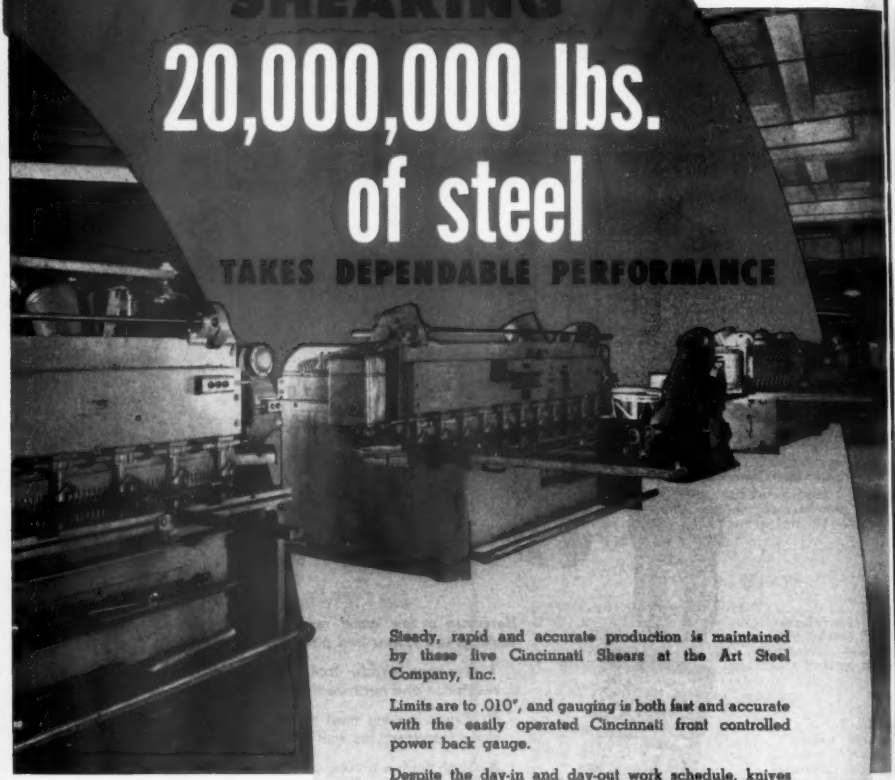
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS
RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT
AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

51-53

SHEARING 20,000,000 lbs. of steel

TAKES DEPENDABLE PERFORMANCE



Photos—
Courtesy the Art Steel Co., Inc., New York, N. Y.

Steady, rapid and accurate production is maintained by these five Cincinnati Shears at the Art Steel Company, Inc.

Limits are to .010", and gauging is both fast and accurate with the easily operated Cincinnati front controlled power back gauge.

Despite the day-in and day-out work schedule, knives are sharpened but once a year.

Investigate these accurate, dependable Cincinnati Shears—you will find them profitable in your shop. Remember, straight-edged square blanks, accurate to size, are produced at low cost on these modern Cincinnati Shears.

Write for Shear Catalog S-6.

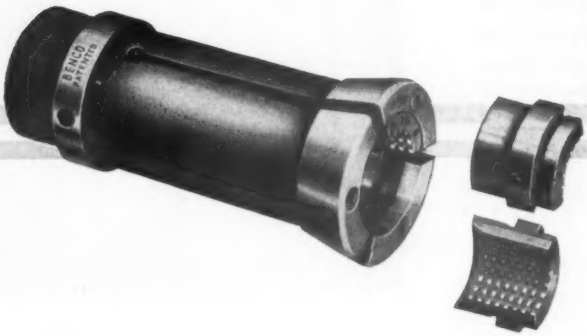
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

grips work tighter
releases work quicker

BENCO COLLET



An important factor to increased production is the speed with which your collets operate. Work gripped tighter reduces "run-outs" and chatter. More production results when stock is released quicker upon the opening of the chuck head.

Benco Collets provide these advantages by being cam-ground on the taper, by the use of selected alloy steels and by proper heat treating. They are engineered to give you more production advantages, longer wearing properties and greater accuracy.

You reduce time lost changing "set-up" when you use Benco Master Collets since the pads are quickly changed without removing the collet from the spindle. "CB" Master Collets use the only pad that is interchangeable with any other pads intended for "CB" Collets of the same machine capacity, regardless of make of machine.

Benco Collets give you production speed and quality at the same time...that's why it pays you to insist on Benco.

BENCO COLLET MANUFACTURING CO.

1563 EAST 27th STREET CLEVELAND 14, OHIO

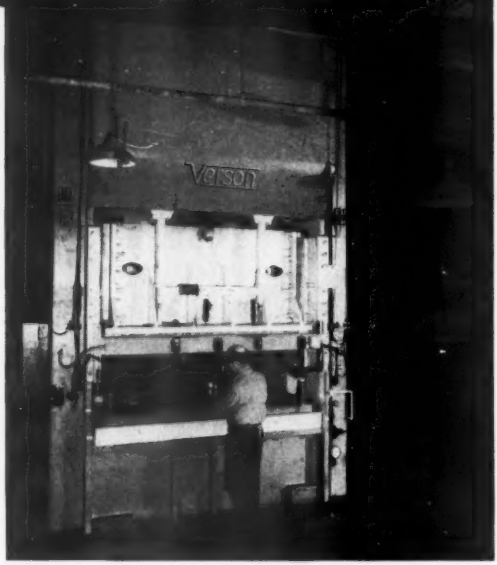
Always Better Constructed Accurate Benco Collets, Pushers and Pads

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

at The Trane Company . . .

proof of the dependability of Verson PRESSES

Over three years of continuous service on a three shift basis without a breakdown for this Verson 250 ton Full Eccentric Press



CONTINUOUS service, day and night, is the real test of any piece of machinery and presses are no exception. Take the case of the Verson 250 ton full eccentric press illustrated. It has been in use around the clock for over three years at The Trane Company, La Crosse, Wisconsin, without a single breakdown or trouble of any sort . . . and it's still going strong. The press is used for stamping orifice plate backs for unit heaters of the type shown in the upper right hand corner of the photograph above.

In addition to providing complete dependability, Verson presses have the rigidity, accuracy and power that assure better stampings and longer die life. You just can't beat them for long term economy.

Whatever your stamping requirements, start planning now to put Verson advantages to work for you as soon as possible.

Write for descriptive literature.

Originators and Pioneers of Allsteel Stamping Press Construction

VERSON ALLSTEEL PRESS COMPANY

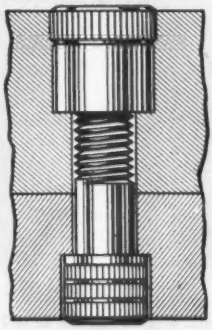
9335 South Kenwood Avenue, Chicago 19, Illinois So. Lamar at Ledbetter Dr., Dallas 15, Texas

A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING
DIE CUSHIONS • COMPRESSION AND TRANSFER MOLDING PRESSES

STRIPPED THREADS ARE COSTLY...

unless you have *Allenuts* handy



When you strip the threads in a casting, do you have to waste costly man-time and down-time while you rebore, tap and install an over-size screw or bolt? And when the job is done are you likely to face the same job on the same piece all over again in a little while?

With the Allenut, simply drill out the hole, insert the Allenut and draw in the hardened self-anchoring knurled flutes by wrenching. Use the same size bolt as before. The heat treated Allenut, with its hardened accurate threads, will make the set-up far stronger than it was originally.

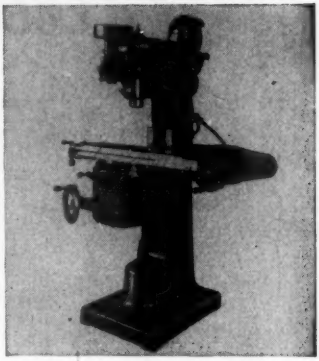
★ There are many uses for Allenuts around the shop — wherever you could use an accurate "ready-made threaded hole."

★ Available in all standard sizes, No. 4 to 1" from the leading Industrial Distributor who sells you Allen® Head hex fasteners.

Remember "INDEX"

The Outstanding Name in
MILLING MACHINES

For High Production and Precision, Low Original and Maintenance Cost



MODEL 40, VERTICAL MILL has proved for 14 years that precision need not be expensive. Thousands in use, giving highly satisfactory performance. While it is not a jig borer, it is widely used for accurate boring and locating. The improved spindle drive gives nine spindle speeds, an ample range for all operations. CAPACITY, ⅛" to 1" end mills in tool steel. TABLE, working surface 8" x 26", 8" x 34" overall.

See Us at the A.S.T.E. Show, March, Chicago

MODEL 55 IMPROVED VERTICAL MILL. A speed range of 80 to 2700 RPM's, 1 H.P. drive, 3⅛" quill, extra rugged spindle, capacity of ⅛" to 1½" end mills in steel. Spindle quill travel is 5¼". Table 40" x 9" or larger.

MODEL 60 PLAIN HORIZONTAL MILL. A full No. 1 that equals or exceeds a light No. 2 in capacity. Designed for the average tool room, but its rigidity and low maintenance cost make it suitable for requirements of production shops. Standard Table 40" x 9" with larger table optional.

Write for Literature

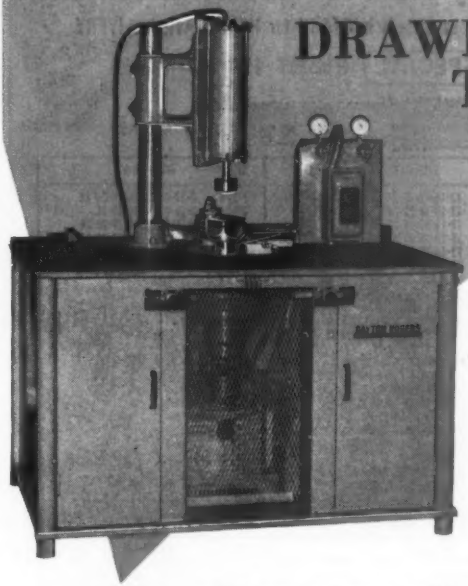
INDEX MACHINE CO.

541 N. MECHANIC STREET JACKSON, MICHIGAN

FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD

DAYTON ROGERS

DRAWN SHELL TRIMMER



LOWER DIE COSTS— BETTER PRODUCTION ON LONG OR SHORT RUNS

The new Dayton Rogers Drawn Shell Trimmer was especially designed to trim square or rectangular shells with small corner radii. It will also bead, knurl, form, serrate, stencil, offset, and bevel. All such shell finishing operations are performed quickly, accurately, and efficiently in one work cycle. It will handle drawn shells of practically any depth and of thickness up to 13 gauge. It is easily and quickly set up and tooling is relatively inexpensive.

Ask fo typical costs and Suggested tooling without obligation!

DAYTON ROGERS
Manufacturing Company

2833 13TH AVENUE SOUTH • MINNEAPOLIS 7, MINNESOTA

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CALL Sid Tool COMPANY "HARD TO FIND TOOLS FOR STOCK DELIVERY"

Why Wait for SPECIAL TAPS?

we have them in STOCK for IMMEDIATE DELIVERY

HIGH SPEED SPECIAL RIGHT HAND TAPS

SIZE	THREAD
4	32-40-80-84
5	30-32-36-40-80
6	30-40-48-56-80
7	32-48
8	24-30-36-38-40-44-48
9	24-28-32-48
10	20-30-36-40-48-84
12	20-24-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	40-56
1/8	32-48
5/32	32-36-40
9/64	36-40
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	16-24-28-27-30-32-36-40
5/16	16-20-22-27-28-32-40
3/8	12-16-18-20-27-28-32-36-40-48
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1-3/16	8-10-12-14-16-18-20-24
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2-3/8	12-16-18
2-1/2	8-10-12
2-9/16	18
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-16
3	8-16
3-1/4	8-12-16
3-1/2	8-12-16
3-7/8	6
4	8-12

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD
0	80
1	56-64-72
2	56-64
3	56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-30-32-40
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32
3/8	16-24-32
7/16	14-20-28
1/2	12-13-20-28
9/16	12-18-20-24
5/8	11-12-18-20-24
11/16	11-16-24
3/4	10-16-18-20
13/16	16
7/8	8-12-14-18-20
1	8-12-14-16-18-20
1-1/8	7-12
1-1/4	7-12-18-18
1-3/8	6-8-10-12-16-18-20-24
1-7/16	8-10-12-14-16-18-28
1-1/2	8-8-10-12-16-18-28
1-9/16	8-10-12-16-18-28
1-5/8	8-10-12-14-16-18-28
1-11/16	8-10-12-14-16-18-28
1-3/4	8-10-12-14-16-18-28
1-13/16	8-10-12-14-16-18-28
1-7/8	8-10-12-14-16-18-28
1-15/16	8-10-12-14-16-18-28
2	4-1/2 - 10-12

• *SPECIAL AND LEFT HAND DIES IN STOCK*

Prices on Application. We are always adding new sizes

NOTE: Oversize - Undersize - 64th and 32nd Size Taps Available for Quick Delivery

• Are you on our monthly mailing list? Write us today!

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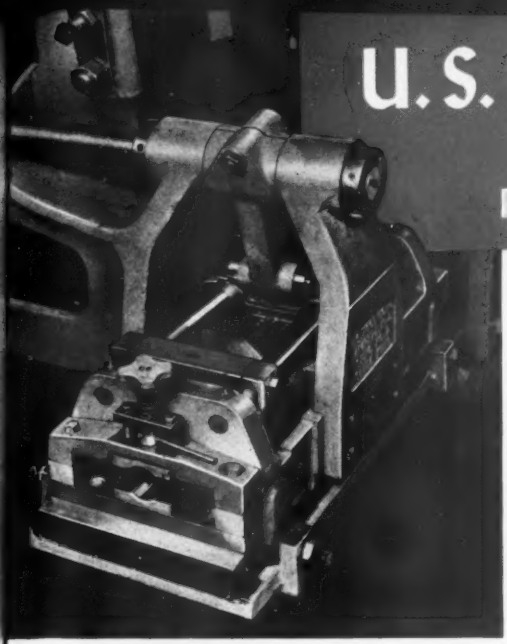
CUTTING TOOL SPECIALISTS
126 LAFAYETTE STREET - NEW YORK 13, N. Y.
PHONE: BE 3-4270

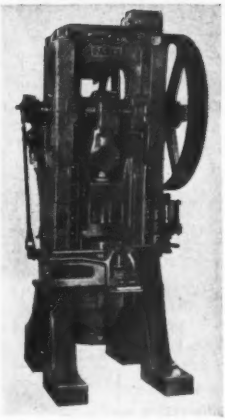


U. S. Slide Feeds

Solve Your Press Room Problems

For Example . . .

The Cleveland Punch and Shear Works Co., Cleveland, Ohio, received an order from The Metal Specialty Company, Cincinnati, Ohio, to furnish a number of their presses equipped with automatic feeds to feed 1⅝" diameter bar stock into the press for a cut-off operation. Because of the nature of the job and the accuracy required, it was decided to use U. S. Slide Feeds.



Accuracy . . .

With the set-up above described, the accuracy of feed length must be such that the weight of the cut-off pieces be within closely controlled limits. The U. S. Slide Feed advances the 1⅜" diameter bar stock into the die ¾" at each stroke of the press, and the weight of the cut-off pieces varies less than 1 gram. With the U. S. Slide Feed the travel of the feed block is constrained between positive stops, thus assuring controlled accuracy.

Versatility . . .

U. S. Slide Feeds are known for their accuracy in the feeding of flat stock from coils, but as described above, they can be used with equally satisfactory results for feeding round wire, bars, and stock of irregular cross section. Also, in addition to metals, U. S. Slide Feeds can be used for the feeding of materials such as paper, plastic, mica, etc.

If you have a press feed problem, ask for a copy of Bulletin 80-T on U. S. Automatic Press Room Equipment, which contains illustrations and descriptions of U. S. Slide Feeds, Straighteners, Stock Reels, Coil Cradles, Stock Oilers, Scrap Choppers, etc.

US PRODUCTS

U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

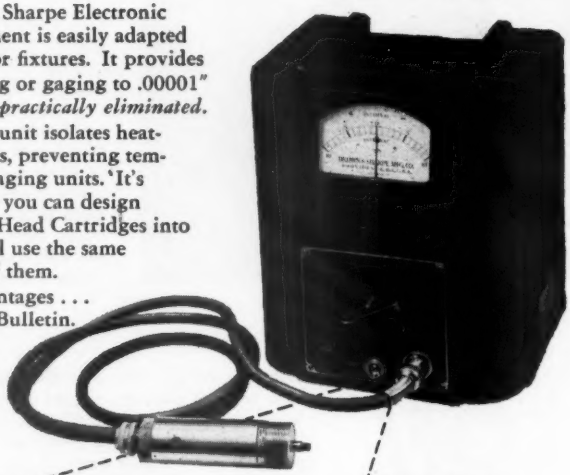
Builders of U. S. Multi-Slides—U. S. Multi-Mill

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accesso

Build *"tenths of tenths"* measuring into your equipment

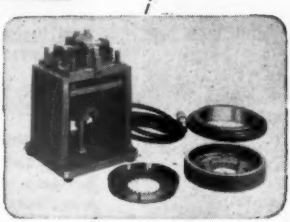
Versatile Brown & Sharpe Electronic Measuring Equipment is easily adapted to your machines or fixtures. It provides fast, accurate setting or gaging to .00001" *with human error practically eliminated.* Separate amplifier unit isolates heat-producing elements, preventing temperature drift in gaging units. It's economical, too — you can design inexpensive Gage Head Cartridges into several fixtures and use the same amplifier for all of them.

Learn all the advantages . . . write for detailed Bulletin.
Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



Brown & Sharpe Electronic Amplifier No. 950 for .0001" to .00001" readings. Gage Head Cartridge No. 953 is plugged in.

Electralign — an application on Brown & Sharpe's own grinding machines. Permits fast, accurate setting of swivel table for grinding of straight work or exact tapers . . . after a single trial grind.



Special fixture utilizes Gage Head Cartridge and Amplifier to measure internal angle accuracy to ± 1½ seconds independently of bore size and without reference to locating surface.

WE URGE BUYING THROUGH THE DISTRIBUTOR

Brown & Sharpe B·S

FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD

SUTTON STYLE "L"

MASTER FEEDERS

lower production costs

Feeder easily removed with special wrench to insert or remove pads

1. Slot in master engages lug on one of the pads, preventing pads from rotating.
2. Tapers on pads and in master give proper lead and allow stock to enter easily.
3. Double angle on side of pad permits worn pad to be brought back to gripping size.
4. Recess in master receives pads and takes operating thrust. NO SCREWS OR PINS TO VIBRATE LOOSE.

NO PINS OR SCREWS

No pins or screws are necessary to hold feeder pads in place. Pads are seated in a recess in the master and a lug on one of the pads engages a slot in the master, keeping the pads from rotating.

COMPENSATION FOR WEAR

Each pad is made with a double angle on each side. Hole size of the pad can be restored by grinding down the points of the angles, allowing tension to bring the pad sections together.

SELECTIVE HEAT TREATMENT

The conventional solid feeder is subjected to 3 heat treatments within a length of 4 to 6 in. The Style "L" is made separately from the gripping pads, which are made from steel selected for wear-resistance.

ONE MASTER PER SPINDLE

Style "L" Masters handle a range of stock practically up to machine capacity. One master and different sets of pads will take care of the full range of one machine.

Department TP-12, Sutton Tool Company, Sturgis, Michigan

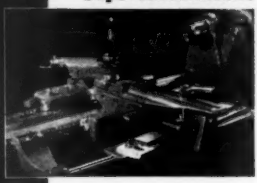
SUTTON COLLETS

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

SOUTH BEND LATHES

For Accuracy Versatility Dependability

Telescopic Taper Attachment



South Bend Lathes combine three distinguishing features which have won for them the acclaim of discriminating machine tool users everywhere:

» Accuracy that permits working to close tolerances and machining work with such smoothness that often one or more finishing operations can be eliminated.

» Versatility to perform easily, quickly, and economically a wide variety of precision operations that otherwise would require installation of additional equipment.

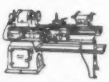
» Dependability achieved through careful design and rugged construction assures day-in, day-out, trouble-free performance at low cost long after the installation has repaid its original cost.

Write today for Catalog 5205 which illustrates and describes the entire line of South Bend Precision Lathes.

SOUTH BEND LATHE
South Bend 22, Indiana
Building Better Tools Since 1906

Send Information Checked:

☐ _____ ☐ 9" and 10" BENCH LATHES



☐ 10" to 16-24" FLOOR LATHES

☐ ½" and 1" Collet TURRET LATHES

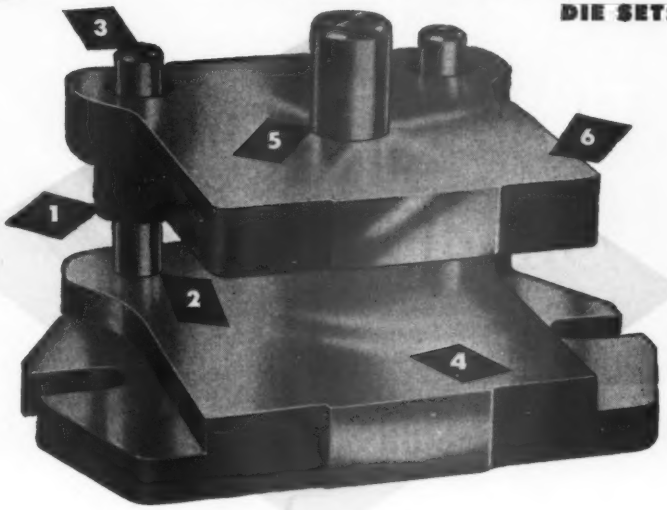
☐ 14" DRILL PRESSES

☐ BENCH SHAPERS

Name _____ Company _____

Street _____ City & State _____

6 reasons for buying.. PRODUCTO DIE SETS



1. Bushings have an absolutely uniform inside diameter, resulting in full-bearing and extra long life.

2. New design die set gives added strength and assures accurate location of pin and bushing holes.

3. Accuracy of guide pins and bushings are checked on light guages reading to 50 millionths of an inch.

4. Parallelism and flatness held to close limits by rough machining prior to grinding.

5. Shank, cast as integral part of semi-steel die set, can be inserted or welded on all-steel sets.

6. Surface plates, accurate to within .0001", check flatness of ground surfaces and parallelism of die set.

To make an accurate die, an accurate die set must be used. For this reason, every Producto die set is an instrument of precision.

If planning a new die today, order your die set by the new Producto catalog — selection is easy, delivery is prompt.

THE PRODUCTO MACHINE COMPANY
970 Housatonic Ave., Bridgeport 1, Connecticut

For Precision Die Sets *Fast* Call . . . PRODUCTO

ALSO MAKERS OF DIE ACCESSORIES, FEEDING EQUIPMENT, VISES, MACHINERY.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

They're TUNGSTEN CARBIDE

They're PRECISION GROUND-FROM-THE-SOLID

Quality Engineered

BURS, REAMERS, END MILLS
BORING BITS & TOOLS
AND OTHERS BY ATRAX

THE
ATRAX
COMPANY

NEWINGTON IN CONNECTICUT

Write for our complete catalog *NOW!*

FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD

● The Greaves Machine Tool Company of Cincinnati, Ohio, a leading manufacturer of Milling Machines, has reduced the time required for boring their machine columns by 75% with Bunell Tooling.

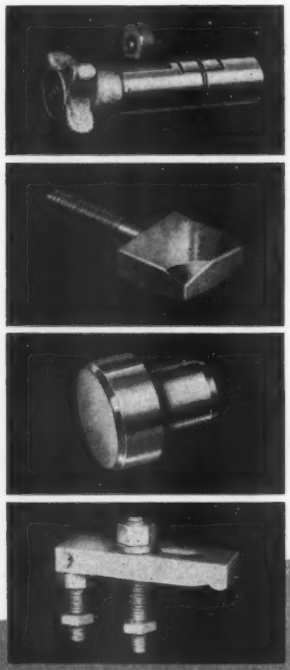
● Greaves is also consistently obtaining a greater degree of precision and accuracy by the use of Bunell Boring Fixtures and Boring Bars (illustrated above). Time and labor savings like this speed production and help Greaves reduce costs and meet shorter delivery requirements of customers.

● Bunell's complete modern plant facilities and experienced engineering staff are available to help you with your tooling problems. Write for full information.

WRITE FOR FREE CATALOG which describes Bunell services, facilities and equipment.

BUNELL MACHINE AND TOOL CO.
1600 EAST 24th STREET • CLEVELAND 14, OHIO
Since 1920. Designers and Builders of Special Tools, Dies, Jigs, Fixtures and Special Machines

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

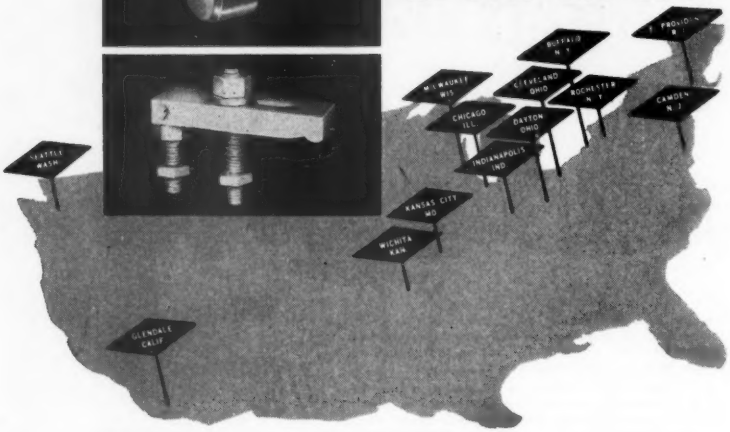


WESPO

Standard Clamps and Components

AVAILABLE IN STOCK

all over the U. S.

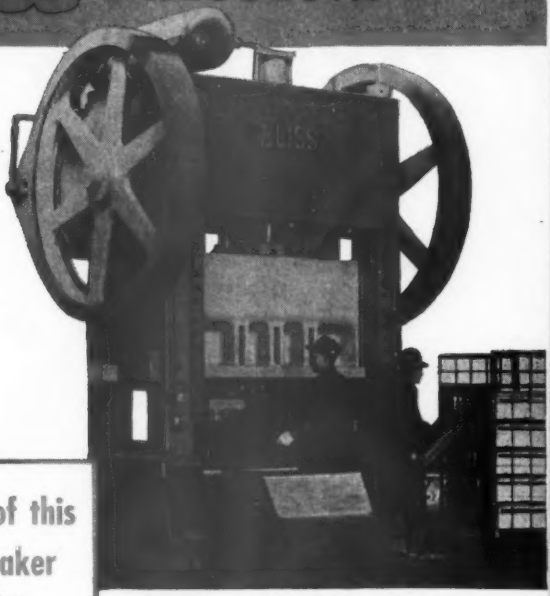


STOCKS AT FACTORY AND FOLLOWING:

T. R. Goldsmith & Son, 33 Clyde Ave.—BUFFALO 15, N. Y.
Fidelity Tool Supply, 309 Vine St.—CAMDEN 2, N. J.
J. R. Reinertson & Co., 24 S. Crawford Ave.—CHICAGO 24, ILL.
T. E. Wardrope Agency, 10014 Euclid Ave.—CLEVELAND 6, OHIO
H. D. Geisler Co., 2715 Salem Ave.—DAYTON 6, OHIO
Mfgrs. Service Supply, 242 Taunton Ave.—E. PROVIDENCE, R. I.
Art Lewis Product Equipment Co., 422 Magnolia Ave.—GLENDALE 4, CALIF.
Standard Die Supply, 26 E. McCarty St.—INDIANAPOLIS 25, IND.
Ernst Machine, 1606 Oak St.—KANSAS CITY 8, MO.
Bell-Well Sales Co., 1323 N. Water St.—MILWAUKEE 2, WIS.
Rekers & Roessel, 1119 Ridge Road East—ROCHESTER 21, N. Y.
H. F. Soderling Co., 1745 4th Ave. South—SEATTLE 4, WASH.
Cummings & Co., 115 E. Lewis St.—WICHITA 2, KAN.

WEST POINT MFG. CO.
26935 W. 7 Mile Road, Detroit 19, Mich.

The trend is to more stampings WITH BLISS PRESSES...



95% of presses of this leading desk maker are Bliss-Built!

NEW 250-TON PRESS is typical of modern Bliss installations at Corry-Jamestown Mfg. Corp. This straight-side press features a sturdy box-frame construction and extra-long slide adjustment.

When it comes to making steel office desks and files, Corry-Jamestown Mfg. Corp., Corry, Pa., is an acknowledged leader. And when it comes to choosing press equipment, Corry naturally turns to the leader in the press field—Bliss.

Throughout Corry-Jamestown's three plants, 95% of the presses are *Bliss-Built*. And in its newest plant, *100%* of the presses over 10-ton capacity are *Bliss-Built*.

Rugged Bliss Straight-Side and Inclinable Presses have helped Corry maintain high quality, speed production, and minimize costs of stampings for its "STEEL AGE" desks and files.

Your local Bliss sales engineer—the trained representative of the world's largest press builder—can show you why Bliss belongs in *your* press room. Remember, Bliss can supply the right press for a given job or a complete press room.

E. W. BLISS COMPANY, CANTON, OHIO
E. W. Bliss (England) Ltd., Derby, England
E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo, and Toronto, Canada. West Coast Representatives: Moore Machinery Company, Los Angeles and San Francisco; Star Machinery Company, Seattle. Other dealers in United States cities and throughout the world.

BLISS ON YOUR PRESS IS MORE THAN A NAME...IT'S A *GUARANTEE!*

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

New Flexible Sealing...
T-J AIR CYLINDER

Designed with revolutionary application of

Super-Cushion

It's *sealed with pressure*—a revolutionary T-J application of flexible sealing that insures positive cushion action combined with automatic valving action for fast return stroke . . . eliminates binding and sticking . . . operates with *low friction, minimum wear,* and *added power* due to higher efficiency.

More PLUS features! New type packing nut incorporates a piloted diameter, assuring perfect alignment. Improved rod packing increases sealing efficiency. Piston rod and internal cylinder tube surfaces are hard chrome plated—a standard practice with T-J for over 15 years.

Write for bulletin 252 . . . The Tomkins-Johnson Co., Jackson, Mich.

1. Metallic rod scraper to protect rod bearing and packing from dirt and grit.
2. Wrench flats.
3. Self-adjusting chevron type packing.
4. Permanent type adaptor ring.
5. Hi-tensile tie rods.
6. Heavy duty, hard chrome plated rod.
7. Generous fillet reduces stress concentration.
8. "O" ring static seal.
9. T-J new flexible cushion seal insures positive cushion with automatic valve action for fast return stroke. (Patent applied for)
10. Fine cushion adjustment.
11. Heavy wall precision honed hard chrome plate.
12. Controlled packing compression with metal to metal contact.

36 YEARS' EXPERIENCE (T-J)

TOMKINS-JOHNSON

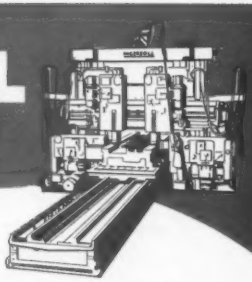
DIVISIONS: AIR AND HYDRAULIC CYLINDERS · CUTTING · CLUTCHES

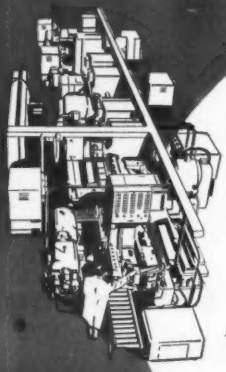
FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD

INGERSOLL

CUTTER GRINDER

The Key to Maximum Production





An Ingersoll Cutter Grinder may cost only 1/100th as much as the production equipment it services, but its importance is far out of proportion to its price. Adequate facilities for grinding cutters accurately and quickly are essential to get maximum returns from large investments in costly production machinery.

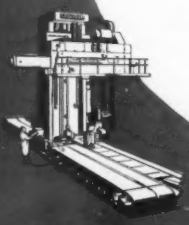
You are undoubtedly sacrificing production

(1) if you do not have enough Ingersoll grinders, or
(2) if your present Ingersoll grinders are in need of replacement.

The Ingersoll Cutter Grinder . . .

Grinds inserted blade cutters *more accurately* because the cutter is located on the grinder in the same manner as on the milling machine spindle.

Grinds cutters *faster* because the face, periphery, and corners are ground in a single setting of the cutter.



Write for Ingersoll Cutter Grinding Manual 5514

The Ingersoll Spin-Grinding Attachment, available on new grinders, cylinder-grinds blades to uniform height on face and periphery. It reduces the time for sharpening a 10-inch heavy duty Shear Clear Face Mill with new T.C. blades from 2-1/2 hours to 2 hours.

THE INGERSOLL MILLING MACHINE CO.

Brake shoes "shined" at 66% savings by 3M Abrasive Belts!

PRODUCTION PROBLEM: To cut high unit costs of finishing brake shoes. Manufacturer found ordinary abrasive belts wore out after preparing only 50 units for bonding of linings. Frequent belt replacement kept abrasive costs at a high $.009 per finished unit.

RECOMMENDATION: 3M Sales Engineers suggested that Wagner Electric Corporation (makers of Comax Brake Linings) switch to longer-lasting 3M Abrasive Belts.

RESULTS: An *immediate* reduction in abrasive costs! Each 3M Belt finished 150 brake shoes—cut costs to only $.003 per finished unit.

Learn how 3M Abrasive Belts can cut *your* costs, too. Send coupon today for full information. No obligation, of course.

MINNESOTA MINING & MFG. CO.
Dept. TP122 St. Paul 6, Minn.

Send me complete information on 3M Abrasive Belts.

Name.....

Company.....

Address.....

City.....Zone...State.....

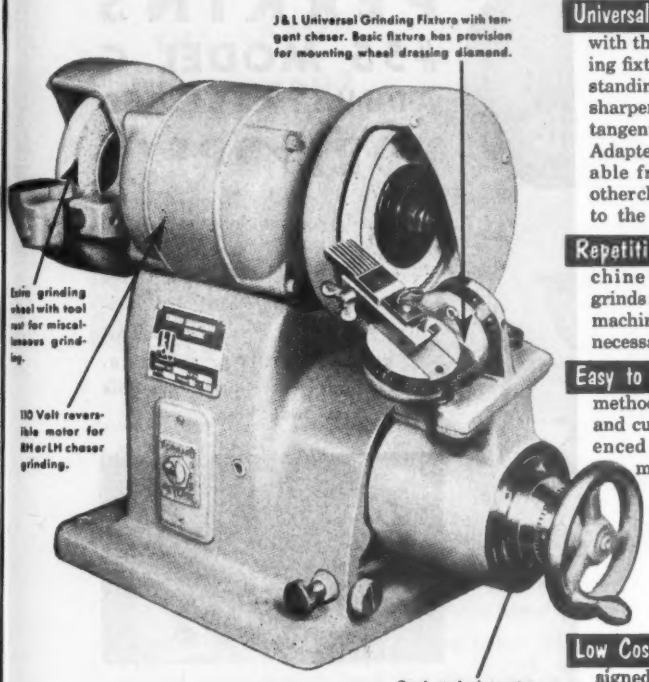
FIFTIETH ANNIVERSARY
3M
ABRASIVE
BELTS
1902 ★ 1952

Made in U.S.A. by
MINNESOTA MINING & MFG. CO.
General Offices: St. Paul 6., Minn.
In Canada: London, Ont., Can.
Export: 122 E. 42nd St., New York City.

Makers of "Scotch"® Pressure-Sensitive Tapes, "Scotch"® Sound Recording Tape, "3M"® Adhesives, "Underseal"® Rubberized Coating, "Scotchlite"® Reflective Sheeting, "Safety-Walk"® Non-Slip Surfacing.

JONES & LAMSON
UNIVERSAL BENCH TYPE
CHASER SHARPENING MACHINE

Specifically designed to resharpen chasers, this *Low Cost*, space saving machine allows you to free heavy expensive machine tools for their intended uses, and at the same time do a better job of chaser sharpening. *It's good for miscellaneous small tool and cutter grinding too.*


J & L Universal Grinding Fixture with tangent chaser. Basic fixture has provision for mounting wheel dressing diamond.
Extra grinding wheel with tool rest for miscellaneous grinding.
110 Volt reversible motor for RH or LH chaser grinding.
Graduated micrometer dial to control infeed.

Grinder set up to resharpen J & L Tangent chasers

Universal Application Equipped with the new J & L chaser grinding fixture and adapters, an outstanding job will be done on all sharpening operations, for both tangent and radial die chasers. Adapters for J & L chasers available from stock. Adapters for other chasers can easily be applied to the chaser grinding fixture.

Repetitive Accuracy This machine will duplicate desired grinds repeatedly. It is a precision machine tool equipped with all necessary stops and controls.

Easy to Operate Simple, direct methods speed up the operation and cut costs. Even an inexperienced operator can, in a few minutes, learn to resharpen chasers on this machine.

Saves Space BENCH SPACE 14 x 28 inches is ample for your complete chaser resharpening operation.

Low Cost This complete unit, designed to do your entire chaser resharpening job, sells for only a small fraction of the cost of other bulkier machines often used Why not install one in your plant, and release your heavier, bulkier machines for their intended uses?

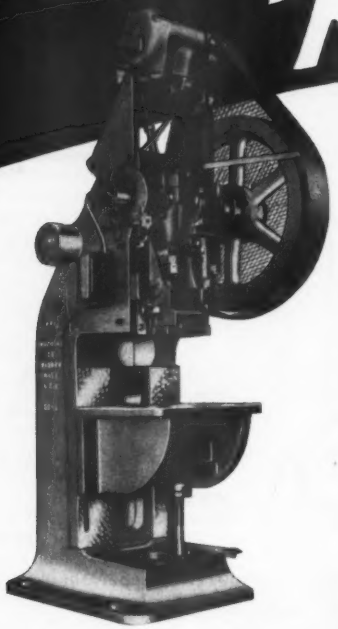
P.S. *Because of its size this machine can well be a time saver in shops where cutter grinding rooms are at distant points from the machines where dies are used. Write Dept. 710G for further details.*

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., Springfield, Vt., U.S.A. Dept. 710 — DIE HEAD DIVISION

New!



PERKINS #55 MODEL G ADJUSTABLE BED HORN PRESS

A heavy duty, versatile press for high speed production wherever a horn press is required. Easily adjustable and quickly adaptable to your particular needs. Bed may be solid, cast on base, adjustable or swinging. Working parts are interchangeable with Perkins 550B Press.

SPECIFICATIONS

Capacity, 45 tons at 100 rpm. of flywheel
Bed Area, 22½" front to back and 26" right to left
Stroke, standard, 3" (can be a maximum of 7")
Distance back from center, 12½"
Distance between gibs, 11½"
Size of shaft at main bearings, 3½"
Size of flywheel, 38" diameter and 750 lbs. in weight

Perkins builds a complete line of presses. View shows a typical installation of Perkins Presses.

PRESSES BUILT TO SPECIAL SPECIFICATIONS

Perkins Power Presses SINCE 1885

PERKINS MACHINE CO.
WARREN, MASSACHUSETTS

FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD

Dickerman

DIE FEEDS BEAT THE LABOR SHORTAGE

by increasing productive capacity

50% to 300%

Handles Stock up to 3/16" Thick

Aside from the tremendous increase in production figures you'll enjoy greatly reduced unit costs by installing Dickerman Die Feeds. Fully automatic, this feed eliminates many operations formerly required by the operator. Its high degree of accuracy reduces blanks and rejects incurred – furthermore, you'll have fewer regrinds and longer die life. Installing a Dickerman Feed is a sure way to beat labor shortage.

Write for further information today. Let us help you with your production problems.

H. E. DICKERMAN MFG. COMPANY Dept. L, 323 **Albany Street • Springfield, Mass.**
Export Address — STATES TRADING, 401 Broadway, New York 13, N. Y.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

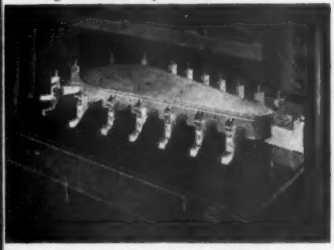
YEARS OF RESEARCH,
ENGINEERING AND PRODUCTION "KNOW HOW" HAS MADE

WALES

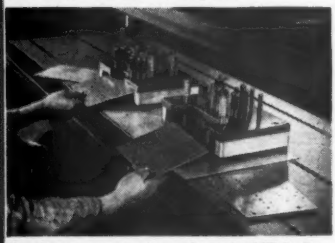
HOLE PUNCHING AND NOTCHING EQUIPMENT

the most complete line

Showing a setup of Wales independent, self-contained Hole Punching and Notching Units with the finished flat sheet in the foreground. Note, nothing is attached to press ram.



Showing a setup of Wales Horizontal Type Units for punching holes in curved and straight flanges and rims with the curved flanged work nested in position ready to be punched around the entire rim. Note, these units are mounted on templates.

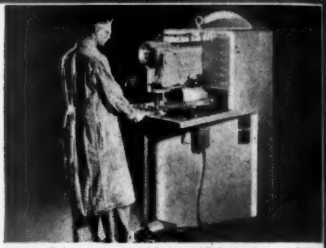


Showing two progressive, self-contained Wales Box-type Assemblies. With Wales Hole Punching Units, any good mechanic can make a hole punching die for press brakes or stamping presses.

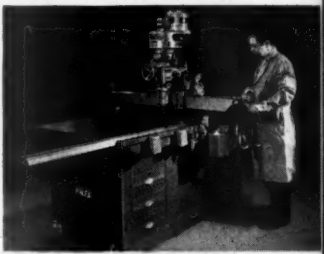
✱ Only creative ability can produce an original and complete line of new patented products. That, basically, is what has made Wales Equipment the leader in tooling for hole punching and notching.

Many metal fabricators have made it standard practice to call in Wales Service Engineers whenever tooling is being planned for hole punching and notching in angles, channels, extrusions and sheets. These fabricators have found it is more economical and time saving to call on Wales before designing and building special hole punching and notching dies because STANDARD Wales Units can be used at greater savings.

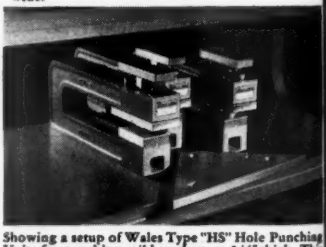
Take advantage of the years of Wales research, engineering and "know how" by writing TODAY for fully-illustrated, functionally colored catalogs of this complete line of Wales Equipment.



Wales Fabricator provides rapid interchangeability for punching and notching. Work from blueprints or operation sheets. No templets required.



Wales Drilling Machine with Boring Head is specially designed to meet the exacting requirements of locating, drilling, reaming and boring holes in material of practically any length and up to 36" wide.



Showing a setup of Wales Type "HS" Hole Punching Units for punching mild steel up to 3/4" thick. This high capacity unit is typical of the versatility and wide range of uses of Wales Hole Punching and Notching Equipment.

WALES-STRIPPIT CORPORATION

George F. Wales, *Chairman*

355 **Payne Avenue, North Tonawanda, N. Y.**

(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment

Savings reported by users of LINCOLN PARK CARBIDE GAGES

CARBIDE CUTS GAGE CHECKING
puts over $20,000.00 annually in our pocket.

A large midwestern motor manufacturer, who has about 100 gages in constant use, found it necessary to check his steel gages for accuracy every day. Changing from steel to carbide gages eliminated this daily checking requirement and he now checks his carbide gages once every 12 weeks. It costs $ .85 to check each gage and based on a 250 day, 50 week year his annual savings with carbide gages are $20,896.00 on checking costs alone.

For further information on how to reduce inspection costs with carbide gages, send for booklet—"If steel gages were FREE."

DESIGNERS AND MANUFACTURERS OF:
SPECIAL AND STANDARD CARBIDE, CHROME PLATED, AND STEEL GAGES—CARBIDE ROTARY FILES—ALSO, FACILITIES AND SKILLED PERSONNEL AVAILABLE FOR PRECISION PARTS PRODUCTION.

THE PLUS IN PRECISION

Lincoln Park **INDUSTRIES, INC.**

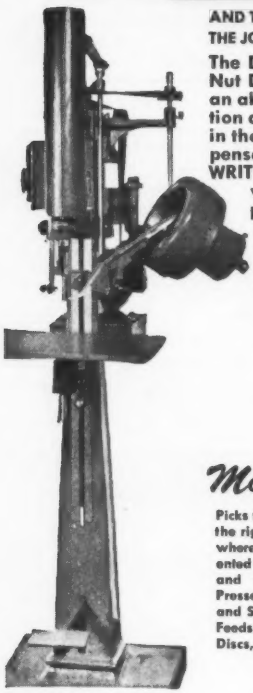
1719 FERRIS AVENUE, LINCOLN PARK 25, MICH.

It's PRODUCTION Today

Speed! More Speed! Is the Call—

AND THESE MODERN POWER-DRIVEN ASSEMBLING MACHINES WILL DO THE JOB FOR YOU AT A REMARKABLE TIME AND LABOR-SAVING PACE

The D.P.S. line of Power Screwdrivers, Motorized Hoppers, Nut Drivers and other power-driven equipment has proved an absolute necessity in the present-day program of production assembling. In replacing slow, expensive hand methods in thousands of plants, they are now intrenched as an indispensable aid in meeting urgent calendar requirements—WRITE US, send sample assembly, receive our catalog, and we shall gladly offer suggestions so that you, too, may profit by the use of D.P.S. equipment.



Model B

DPS POWER SCREWDRIVERS

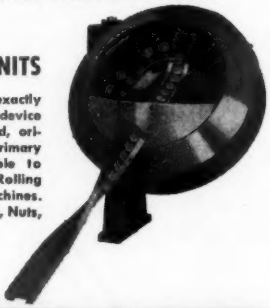
DRIVE SCREWS AS FAST AS ONE A SECOND

All types of screws: Machine screws, sheet metal screws, self-tapping screws, with standard round, flat, binder, fillister or hex heads and special heads. No marring of heads or stripping threads; all screws driven to uniform tension. Hopper fed, SCREWS ALWAYS IN SIGHT OF OPERATOR. 3 models.

Motorized HOPPER UNITS

Picks them up and lays them down in exactly the right position—A selective feeding device whereby production parts are selected, oriented and fed in a given position for primary and secondary operations. Adaptable to Presses, Centerless Grinders, Thread Rolling and Slotting Machines and Special Machines. Feeds Screws, Screw Blanks, Rivets, Pins, Nuts, Discs, Washers, Steel Balls, etc.

6 sizes, 8", 10", 12", 16", 24" and 30" diameters



DETROIT POWER SCREWDRIVER CO.

2827 W. FORT ST. DETROIT 16, MICH.

For those...
UNUSUAL TAPPING OPERATIONS

USE S-J SCULLY-JONES

HEAVY DUTY TAP HOLDERS and CLOSE CENTER TAP DRIVERS

EASY TO HOLD AND DRIVE LARGE TAPS

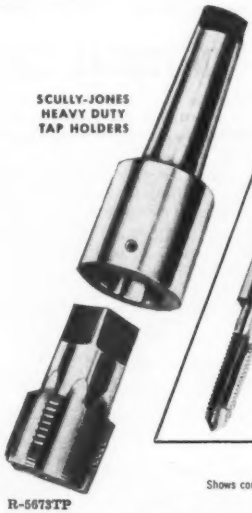
These rugged, one-piece tap holders are widely used in radial drills, drill presses, turret lathes, horizontal boring mills and similar machines for heavy duty tapping operations.

The thick body wall takes a lot of punishment, yet is not oversize in relation to spindle diameter. Hole and shank are concentric within .002". The hole centers the shank of the tap, and a broached square furnishes a positive drive.

MAXIMUM CLEARANCE BETWEEN CENTERS

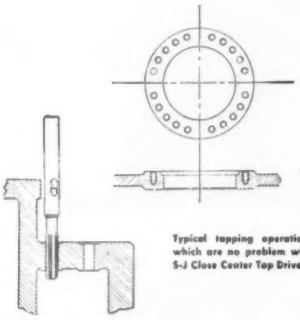
When tapping holes close together or near a shoulder, the S-J Close Center Tap Drivers will do the job. As they are smaller in diameter than machine spindles, they provide maximum clearance between centers.

The hardened, splined section furnishes a positive drive for the square of the tap. Collet action of the split bushing on shank of tap reduces strain, and cuts down tap breakage. As the tap works harder, bushing grips shank tighter. Three series—short, medium and long.



SCULLY-JONES HEAVY DUTY TAP HOLDERS

SCULLY-JONES CLOSE CENTER TAP DRIVER



Typical tapping operations which are no problem with S-J Close Center Tap Drivers.

Write for Bulletin No. 4-50
on Scully-Jones Tap Holders and Drivers.
Shows complete range of sizes, specifications and prices.

Scully-Jones AND COMPANY

R-5673TP

1913 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

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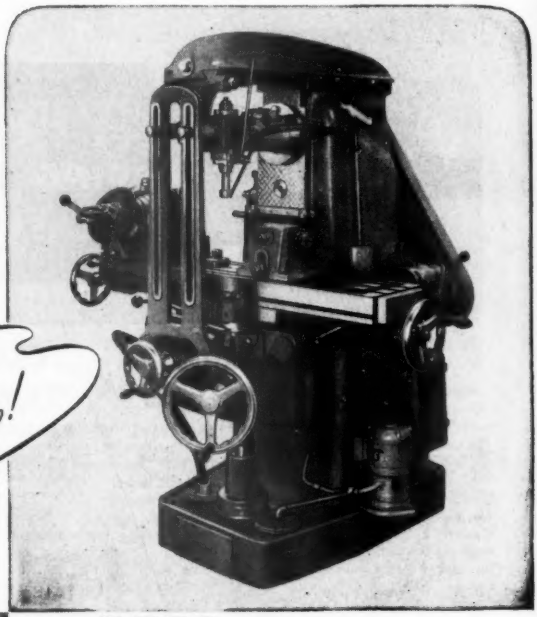
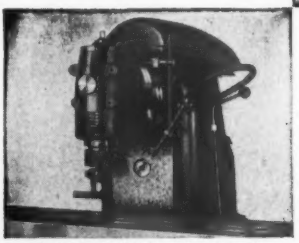


Swedish Craftsmanship!



Sajo Vertical Milling Attachment

The Sajo "Plain" Milling Machine

the SAJO "UNIVERSAL" MILLING MACHINE

exemplifies the expert workmanship that is traditional in Swedish machine tools. Like all SAJO Millers, this new Universal Milling Machine was designed and built to the highest standards of quality and practical utility.

Avoidance of exterior "luxury" features, slight in value but substantial in cost, and concentration on the vital factors of construction, enable the SAJO to deliver top performance at moderate cost.

SAJO Millers are available in Plain and Universal types, with longitudinal power table feed only, or with power feed in all directions. Screws and dials are in the U. S. inch system.

★ Standard Equipment includes:
3 HP motor and starter equipment, motor driven coolant system, adjustable table feed nut to allow climb-milling, 1" arbor, arbor support brace.

★ Extra Equipment:
Universal Dividing Head, Vertical Milling Attachment, Slotting Attachment, Swivel Base Vise, Rotary Table.

CONDENSED SPECIFICATIONS

Table Size	41⅛" x 9¾"
Longitudinal travel: Plain Miller	24⅛"
Universal Miller	27⅛"
Transverse travel	8¼"
Vertical travel	19"
12 spindle speeds	36-1540 RPM
Table feeds	12
Taper in spindle	No. 40 NMT
Main motor	3 HP

Precision anti-friction bearings on spindle and gear shafts
One-piece column and base
Net weight—2200 lbs.

Write for Catalog

NO PRIORITY—— PROMPT DELIVERY——ATTRACTIVE PRICE

AUSTIN INDUSTRIAL CORP. 76-X MAMARONECK AVE. WHITE PLAINS, N. Y.
DEALERS IN PRINCIPAL CITIES

FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD

New • Fast • Proven

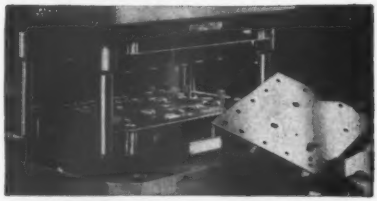
LOW COST methods for PERFORATING and NOTCHING SHEET METALS

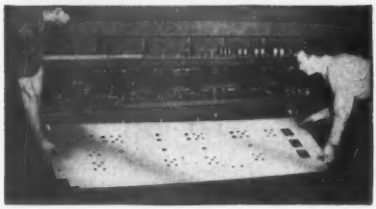
Whistler *MAGNETIC* Dies at work in large inclinable press. Magnetized retainers hold the units. No bolting required. A fast, economical method in making up a punch and die set for short or long runs. All parts re-usable.

Whistler *ADJUSTABLE* Dies on perforating and notching job, using Tee slotted die set. With Whistler Adjustable Punch and Die units production starts within hours instead of weeks. Last minute job changes made quickly.

REDUCE DIE COSTS

All units and parts are interchangeable and used repeatedly in different arrangements. **INCREASE PRESS PRODUCTION**—*Down time is minutes as compared to hours for change-over.* For precision work in all types and sizes of presses. **START PRODUCTION AT ONCE.** Pierce materials up to ¼" thick mild steel. Standard sizes and shapes available up to 3 inches. Special sizes to order.





● Here are the complete details with prices and application illustrations. Send for these catalogs. No obligation.

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ADDRESS

CITY ZONE STATE

S. B. WHISTLER & SONS, Inc.

Adjustable, Magnetic, Custom and Cam Dies for all Industry

748 Military Road, Buffalo 23, N. Y.

For your convenience **Whistler direct factory representatives are located in most principal cities. Their on-the-job application experience, combined with Whistler's 35 years experience in the manufacture of tools and dies, is available on request.**

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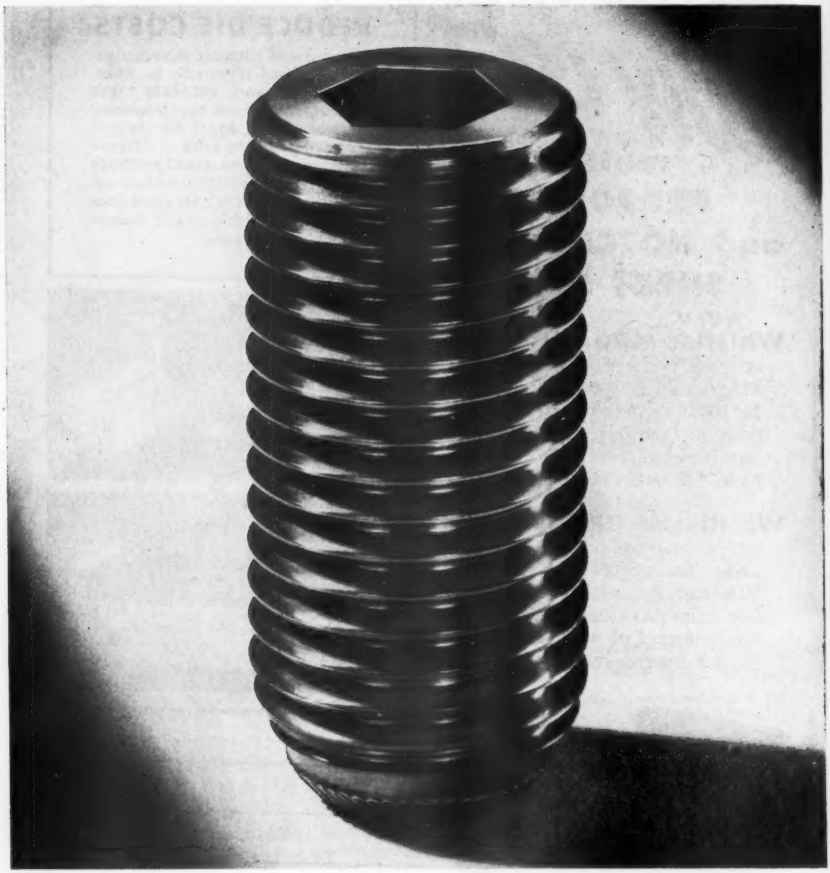

For positive, vibration-resistant SELF-LOCKING UNBRAKO SOCKET SET SCREWS

UNBRAKO Self-Locking Socket Set Screws won't work loose. Non-slip internal wrenching provides positive drive. Self-locking feature prevents creep and subsequent loosening. Machinery stoppage and production losses are materially reduced. Write for descriptive literature. STANDARD PRESSED STEEL CO., Jenkintown 36, Pennsylvania.

Standard UNBRAKO *Self-Locking Set Screws, #4 to 1" inclusive, are available from your* UNBRAKO *distributor's stocks. Ask him for your supply.*

SPS

See us at the A.S.T.E. 20th Annual Convention, International Amphitheater, Chicago, Ill., March 17 to 21, 1952

JENKINTOWN, PENNSYLVANIA

UNBRAKO SOCKET SCREW DIVISION

CAP SCREWS • SET SCREWS • SHOULDER SCREWS • DOWEL PINS • PRESSURE PLUGS

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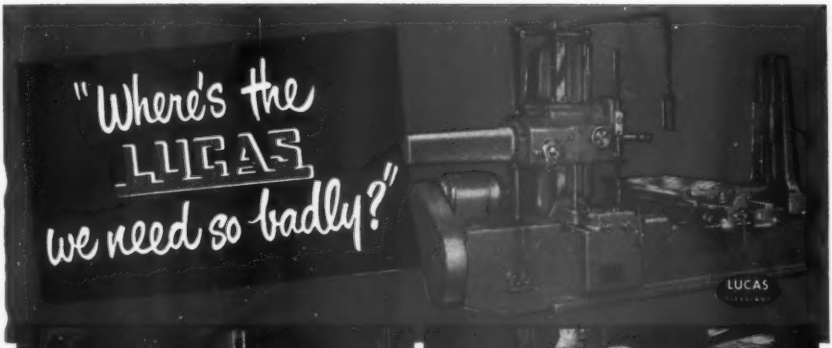
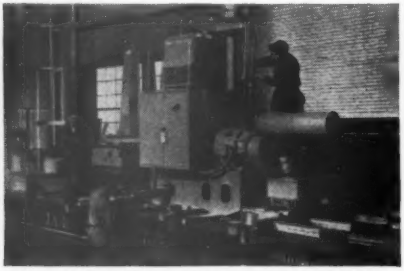


The ultra modern Lucas plant is being used to full capacity with work in process and rough castings waiting to be machined.

Lucas machines at work making components for more Lucas machines, in our plant and in the shops of many outside suppliers.

Still no sacrifice of Lucas standards. Ultra modern production methods, but still the skilled hand craftsmanship for which there's no satisfactory substitute.



More shipments than ever, but, of course, defense priorities dictate who gets what. Perhaps this is the machine we originally scheduled for you.

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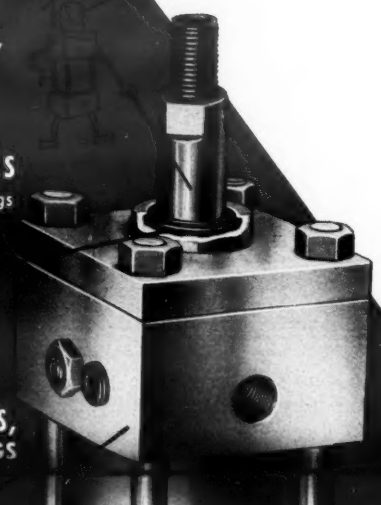
Miller

AIR CYLINDERS

HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

DIRT WIPER SEALS
Protect Rods, Seals, Bushings

SOLID STEEL HEADS, CAPS and MOUNTINGS



FOUR WEEK DELIVERY

(dependent upon your allowing us more time on non-rush orders)

to meet your

RUSH

cylinder requirements

on all Standard Models except

Models 81 and 82	6 weeks
Water Fitted Models	7 weeks
Precision Seal and Other "Specials"	8 weeks and longer

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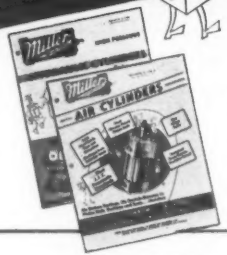
CAPS and MOUNTINGS

BRASS BARRELS
Eliminate Rust and Corrosion



WRITE FOR CYLINDER BULLETINS A-105 and H-104

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. PNEUMATIC STANDARDS years before their adoption in 1950.

SPACE-SAVING SQUARE DESIGN originated by Miller in 1945.

Visit our Booth #1016 January 1953 Plant Maintenance Show!

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MILLER MOTOR COMPANY

Miller

2046 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

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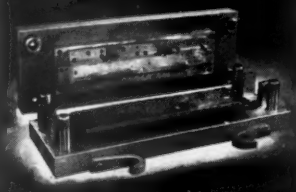
DANLY SPECIAL DIE SETS



Completed die for blanking a Nash door component—built for longer die life in a Danly all steel 4-post special die set.

Danly all steel 4-post special die set, 14" x 44".

help Nash meet close production schedules!

Dies play a big part in modern high-speed automobile production. They have to be ready on time when model changes are scheduled and they have to stand up under three-shift operation day in and day out with a minimum of down time. That's why you'll find so many Nash production dies built in Danly Special Die Sets. A Danly set means fast delivery to meet the tooling schedule and a rugged, precise base for the dies that assures maximum die life.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT —CALL YOUR NEAREST DANLY BRANCH

***CHICAGO**	50	2100 South Laramie Avenue
***CLEVELAND**	14	1550 East 33rd Street
***DAYTON**	7	3196 Delphos Avenue
***DETROIT**	16	1549 Temple Avenue
***GRAND RAPIDS**		113 Michigan Street N.W.
INDIANAPOLIS	4	5 West 10th Street
***LONG ISLAND CITY**	1	47-28 37th Street
***LOS ANGELES**	54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE	2	111 East Wisconsin Avenue
***PHILADELPHIA**	40	511 W. Courtland Street
***ROCHESTER**	6	33 Rutter Street

**Indicates complete stock*

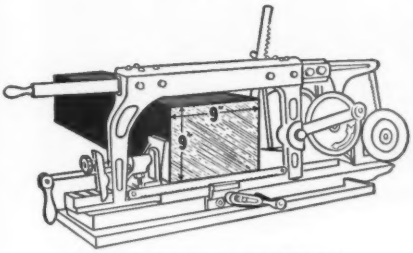
View of die shown above mounted in 150 ton press at the Seaman Body Plant of the Nash Kelvinator Corporation in Milwaukee, Wisconsin.

DANLY®

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES

NEW... Greater Capacity

9" x 9"



Variable No. 0-200# Pressure Feed Control

Keller No. 5 Hy-Duty Power Hack Saw, 9"x9" Capacity

KELLER *Power* HACK SAWS

offer you this new reasonable priced, fast cutting saw with a capacity of 9" x 9". Saws all types of metals and gives a neat, accurate cut. A patented pressure feed control allows pressure to the saw blade to be varied from 0 to 200 pounds . . . minimizes wear on saw blades. Provides fast cutting of thin walled to heavy solid bars. Provides maximum output at a minimum investment.

Ask about the New Keller #5 Today.

FREE CATALOG

Mail this coupon for complete specifications on the New #5 and nine other Models of KELLER POWER HACK SAWS.

Please send me FREE, complete specifications of the New #5 and nine other models of KELLER POWER HACK SAWS.

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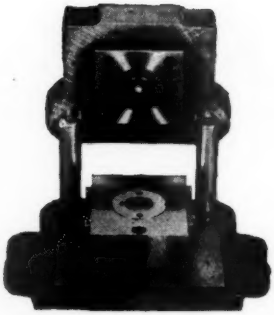
A MUST wherever WASHERS are made!

HOVIS

OFFERS YOU THIS SIMPLE, UP-TO-THE-MINUTE METHOD

There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.



Made in 5 sizes:

¾"—1½"—2½"—4"—6"

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8100 E. NINE MILE ROAD
Phone: Slocum 7-4800

VAN DYKE, MICHIGAN
Suburb of Detroit

"Jeepers! That putter of Mac's is as accurate as a

Logan **LATHE!"**

Logan No. 955
QUICK CHANGE GEAR LATHE
11" Swing, 1" Collet
Capacity, 1⅜" Spindle Hole

PRECISION RESULTS have made the Logan Lathe one of the world's most widely used machine tools. Logan advanced design and rugged, precise construction assure accuracy that stands up under hard daily use. Because the Logan ball bearing spindle, for example, needs no adjustment for any speed from 45 to 1500 rpm, original accuracy is preserved. The two V-ways and two flat ways of the Logan bed are precision ground to a tolerance of .0005", and are warp-free. 11" swing, 1" collet capacity and 1⅜" spindle hole provide the capacity for a high percentage of any shop's metal turning. Remember, too, no other lathe of comparable specifications can match Logan economy.

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

LOGAN ENGINEERING CO.

4901 West Lawrence Avenue, Chicago 30, Illinois

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LEMPCO Die Sets *Cost Less* by reducing cost per piece

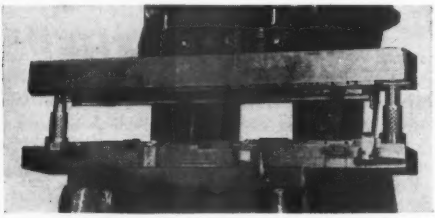
Perfect alignment of pins and bushings mounted with pre-loaded ball bearings enables the die to close more accurately, produce less scrap, yield more pieces per grind. The dies last longer. Also eliminates binding on extended or overhung dies.

A dab of cup grease at regrinding time is all the lubrication that is necessary. You can forget about maintenance when your die is in the press. Frozen bushings, scored pins and chipped dies are rare occurrences. Frequently an entire production run can be completed before regrinding is necessary.

Yet with all of these advantages, Lempco Die Sets cost very little more than other die sets. Delivery on most sizes within 5 days, others in two to three weeks. Write for catalog and prices.

Save 15 minutes out of every 60 in die assembly . . . no pry bars, lead hammers or die pullers necessary.

Perfect alignment on every try.



LEMPCO PRODUCTS, INC.
Industrial Division
Bedford, Ohio

LEMPCO DIE SETS are priced competitively

LEMPCO *for 35 years . . . a leading builder of machine tools*

New Rotor B-35 Vertical Grinder with 6" cupwheel smooths a casting.

New Rotor B-35 Vertical Sander with 9" pad blends welds of machine base.

Speed up the job with these

NEW ROTOR VERTICALS

YOU should try these new Rotor "power houses"! See how fast they remove metal. See how easy they are to handle... light in weight (only 10¾ lbs.) because of magnesium castings . . . comfortable balance because of adjustable handle angle.

Ask for a demonstration! Write for free copy of Catalogue No. 40.

Air O'Tool and Hi-Cycle O'Tool

EXAMINE *It Closely*

THERE IS A DIFFERENCE

Model J, 10" x 18" capacity. Available as a wet or dry cutting machine.

JOHNSON METAL CUT-OFF BAND-SAWS

Have Outstanding Features

If you are thinking about new metal-cutting equipment, it will pay you to investigate the outstanding features of the Johnson Metal-Cutting Saws. Their exclusive design, ample capacity and ruggedness speak for themselves. These efficient low-cost machines offer the highest value available today.

Write for Details Today

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ALBION, MICHIGAN

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Backed right here in the U. S. by skilled technicians, factory service and guarantee, and spare parts readily available from every Hirschmann Branch.

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CHUCKS
Keyless Drill
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DIE SETS
DIE SINKERS
DRILLING & TAPPING MACHINES
FINISHING MACHINES
Precision
FORMING & CUTTING-OFF MACHINES
Automatic
GEAR HOBBING MACHINES
GRINDERS
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GRINDING MACHINES
Hydraulic • Hydraulic Cylindrical
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For Watchmaking and similar industries
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Semi-Automatic
THREAD CUTTING MACHINES
Automatic
THREAD ROLLING MACHINES
Automatic
TOOLS
Screw Machine-Carbide and High Speed Steel
TURNING MACHINES
Semi-Automatic

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3P

Make a *longer* profit on SHORT RUN JOBS with the new

Porter "AC" PUNCH and DIE UNIT!

"Still the best performer"

- EASILY SETUP
  Can be mounted on 1" centers
- SELF CONTAINED
  with "built-in" stripper
- NO SHAKE—NO WIGGLE
  with pressfit mounting
- EASILY CHANGED
  No high-tension spring to fight
- NO SLUG JAMMING
  Slugs ejected by air
- NO EXTRA CHARGE
  for "special" punch sizes

Save time—save money with 3P products. *Depend* on Porter to deliver the punch you want—*when* you want it! Immediate Delivery. Always in stock.

PORTER PRECISION PRODUCTS

PRinceton 6338 P.O. Box 208 Cincinnati 15, Ohio

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*CLEVELAND, OHIO	GLenville 1-3083	NEW YORK, N. Y.	WOrth 2-7438
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*Indicates complete stock.

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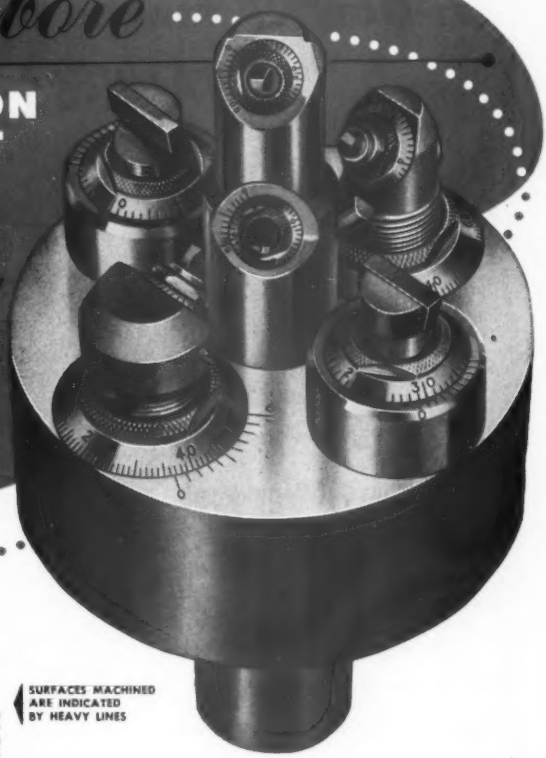
Microbore

PRODUCTION EQUIPMENT

Engineered and manufactured by

DEVLIEG



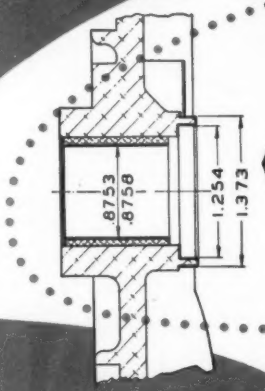


Illustration shows Microbore cluster tools for machining eight surfaces on a magneto plate at one pass. Each tool is independently adjusted by proven micrometer vernier principle and concentricity of work piece is maintained to precise limits on production runs.

For the latest developments in precision tooling consult

DEVLIEG of DETROIT

DeVLIEG MICROBORE CO. 480 Fair Avenue • Ferndale 20, Michigan, U.S.A.

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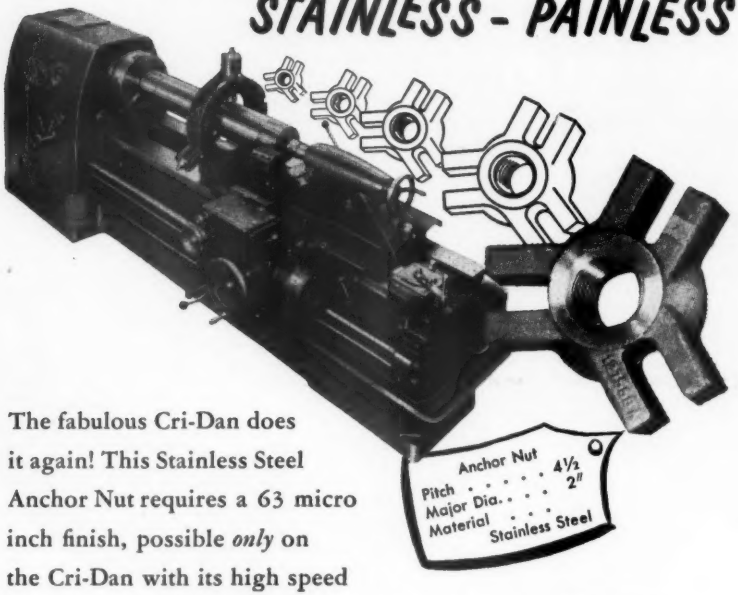
Cri-Dan "D" makes threading

STAINLESS - PAINLESS



The fabulous Cri-Dan does it again! This Stainless Steel Anchor Nut requires a 63 micro inch finish, possible *only* on the Cri-Dan with its high speed and its use of a Single Point Carbide Tool. The resulting production is *five* times that of a lathe with a chasing operation.

If you want peak production and painless precision on "impossible" threading jobs call on Lees-Bradner and Cri-Dan "D".

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

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HAND GRINDING
RUBBER REGULATING WHEELS
REFRACTORIES
CENTERLESS GRINDING
Ready for Tomorrow's BETTER GRINDING!
MODERN SANDING
Looking Ahead,
BAY STATE sees real progress in both materials and methods for increased quality and production. Here at BAY STATE, we are ready with the abrasive products to make such progress possible . . . both now and in the future.
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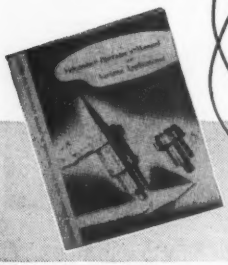

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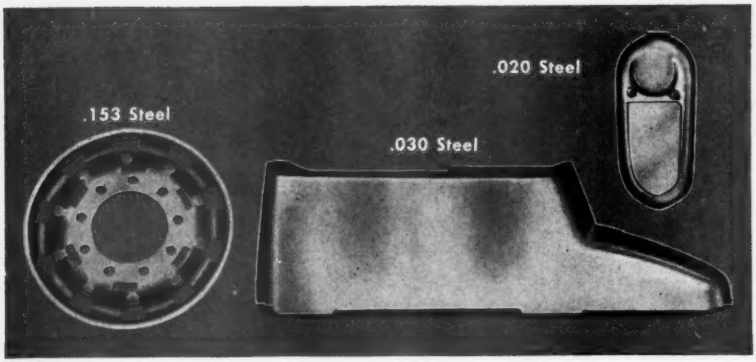

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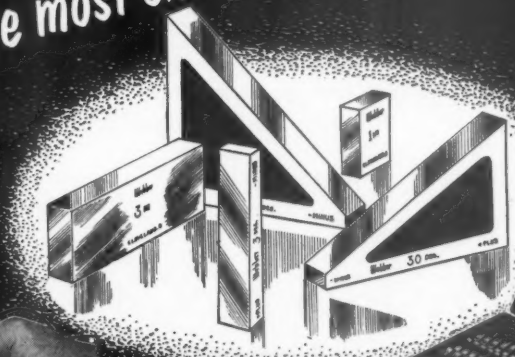

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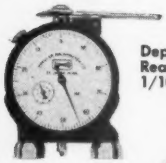

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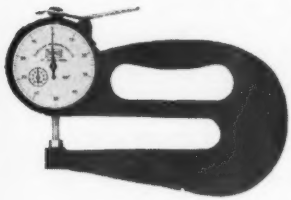

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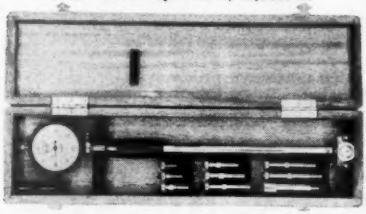

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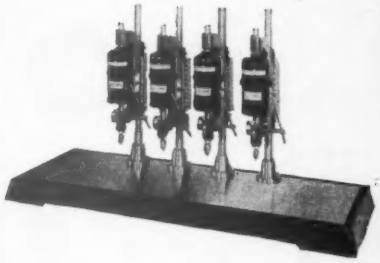

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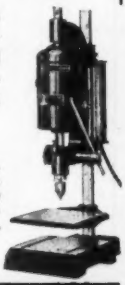

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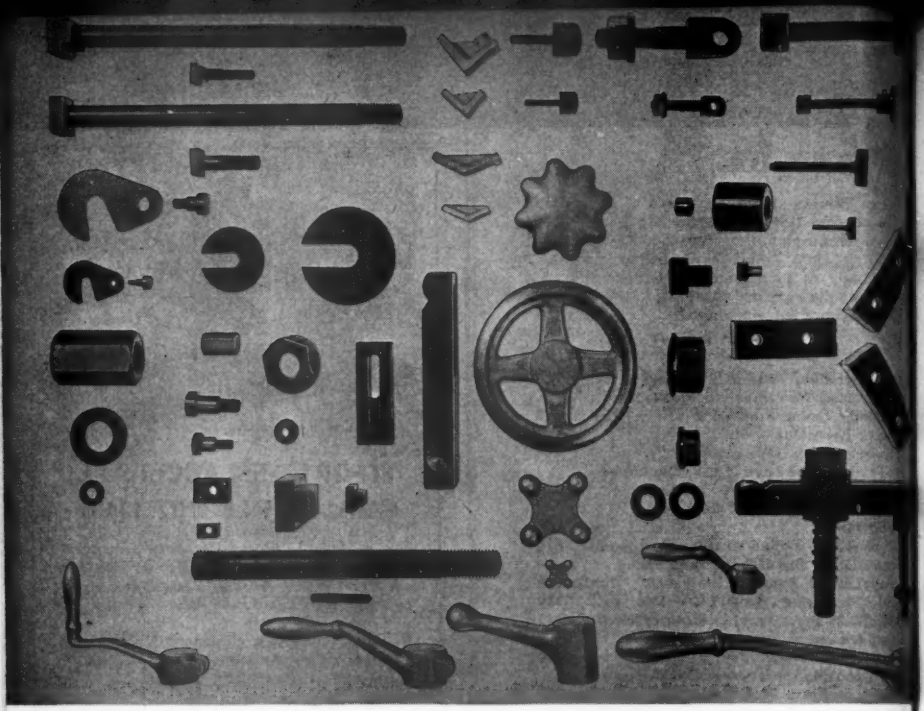

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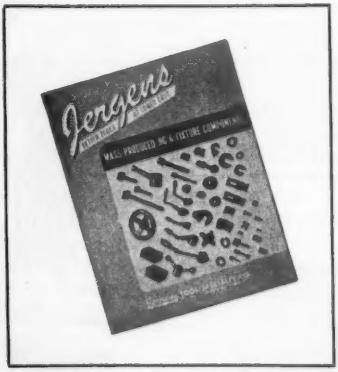

Yes, economize in man hours—save skilled tool room personnel—valuable time of designers, increase production and save up to two-thirds the cost using Jergens Mass-Produced Components as standard in your plant.

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cheap labor can be expensive

In the world of manufacture, i.e., the converting of materials into end products with which to attract customers, high productivity and increasing productivity are the key to meeting competition in existing markets and to opening up new markets.

This is the challenge that constantly confronts the American manufacturer, and it is the challenge that he is best equipped to meet be he a builder of machine tools or of the things produced by machine tools.

To build "more", "bigger" and "better" is as ingrained an American tradition as baseball or pumpkin pie. This holds true whether we are considering automobiles, pop bottles, garden hose, bridges or razor blades.

And right along with this, the American manufacturer pays a wage rate that is the envy of the world and which has given the American wage earner a standard of living truly incomprehensible by his foreign counterpart.

It is small wonder then that, on the face of it, the mention of foreign competition, particularly as regards our own domestic markets, is prone to cause alarm, to give rise to fears of market invasions by cheap foreign labor, and to germinate pressures in Washington for more artificial controls.

Let us see what some people, who should know the score, have to say about the threat of cheap foreign labor.

To say that the 6000 members making up Detroit's Board of Commerce are leading exponents of free enterprise, past masters of mass production, and ultra-skilled developers of industrial and consumers markets, is quite an understatement.

Further, with the Board headed up by John S. Coleman, president of Burroughs Adding Machine Company which has outlets all over the world, any statements by the Board on the subject of foreign trade can well be listened to not only as the voice of experience, but the voice of successful experience.

Even though Detroit industries, along with many others, are protected from competition by tariffs on imported goods, the Detroit Board of Commerce, as the result of a ten year study of foreign trade, has announced its conclusion that the best interests of labor, consumers, and industry, are not served by high protective tariffs.

On the subject of "cheap" foreign labor (and the implied threat that it could lower the American wage earner's standard of living) the Board says:

"Foreign labor is not cheap! Productivity as well as wages determine the value of labor. The employees of Detroit and Michigan industries, as a result of heavy investments in equipment, tools and machinery, and improved techniques of production, are competitive with other labor groups throughout the world."

A few days ago we were in a plant noted for turning out millions of household equipment replacement parts. One component was in the final stages of being retooled for virtually automatic production; still higher productivity.

We were told that a similar product "was beginning to come into this country from a foreign source, produced by cheap labor operating conventional machines". Hence the retooling.

Highly skilled, highly paid, machine and tool designers and builders had dreamed up new high production equipment to be operated by highly paid workers with the result that "we'll be able to beat the pants off them for price!"

No lowering of workers' living standards in that picture. The householder will pay even less for an already low-priced item, with enough left over for a package of cigarettes. And, the "cheap" foreign labor, by exposure to American enterprise, becomes too expensive for the market.

Examples are legion. The point is that American tooling and production know-how, and the investment by free enterprise of thousands of dollars in plant and equipment per employee, and the resultant high productivity of highly paid workers, constitute a proved and unbeatable combination.

E. Willard Cunningham

editor

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WRITE for BULLETIN 521 TODAY

Cut and Carry Automatic Dies . . .

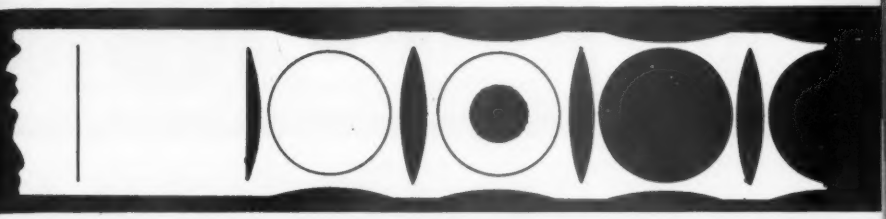


Fig. 1. Slit Cutout.

Cutouts for Shallow and Deep Cup Drawing

Cut and carry automatic dies, as the name implies, are dies wherein the blank, instead of being fully cut out, is left partly connected to the stock strip so that it (the blank) can be carried on through the subsequent stations of the die. This method of cutting out around the blank permits the free movement of the metal during the drawing of the cup without loss of pitch.

"Pitch" as used here means the increment of travel or mechanically fixed distance between successive stations of the die. Drawing the metal into a three-dimensioned shape (compared to the plane dimensions of a simple blank) means that the metal has to come from somewhere within the confines of the strip.

But, in "coming from somewhere" or in being "subtracted" from the strip's area or dimensions, the one dimension that must not be changed or trifled with is the distance (or increments) along the developed strip which equals the distance between successive operations or die stations.

Within a given die the distances or increments of stock feed between successive stations must be equal and unvarying. Obviously, the travelling strip stock must leave the die at the same rate it enters.

The "cutout" or pattern of initial openings made in the strip dictate the successful flow and behavior of the metal. The cutout, ordinarily, is the first station of an automatic die. Some cutouts, of intricate pattern, require more than one station to complete.

Engineering the automatic die is quite complex, but if the designer understands certain successful practices he has a better opportunity to design a die that will perform as intended. These unique dies if properly engineered and built will produce accurate and intricate stampings at bewildering speeds.

One of the first decisions that the die engineer must make concerns the proper type of cutout to be employed for a given design of workpiece. This decision can be simplified if he will have a simple draw die made which can be set in a conventional press. With a few trial hits he will be able to find out not only the blank size but can also determine the best suited

by **Ernest J. Urbas**
Superintendent
Tool and Die Department
THE GUARANTEE SPECIALTY MANUFACTURING COMPANY
Cleveland, Ohio

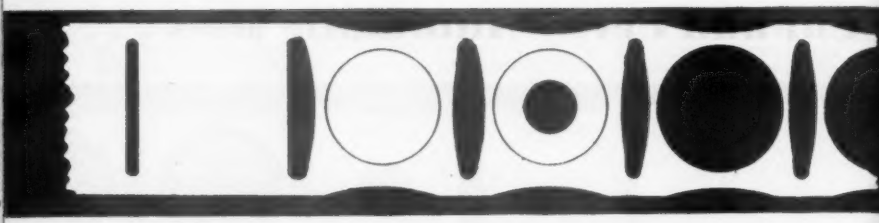


Fig. 2. Slot Cutout.

style of cutout to be employed on that particular type of blank. The blank size may be figured mathematically but because of the risk of unpredictable variables it is better to follow this suggested and proved procedure.

The strips in the accompanying illustrations are from automatic dies which operate in Henry & Wright dieing machines. These machines range in capacity from 25 to 100 tons, with speeds ranging from 40 to 280 hits per minute. The greatest advantage the dieing machine has over the conventional type of press is the possibility of applying pressure (spring, rubber or air) on both the upper and lower parts of the die. This pressure arrangement permits revolutionary designs in drawing dies. The dieing machine with its four guide posts gives extremely long die life between grinds.

Each piece of auxiliary equipment used in conjunction with the dieing machine contributes greatly to maximum production with the least amount of effort. This equipment consists of: self uncoiling stock reels that handle extremely large diameter coils; automatic feed rolls; automatic stock straighteners controlled by the speed of the press; stock oilers; scrap cutters; speed controls; conveyors which can be used to great advantage in sorting or keeping separated any dissimilar parts made on a multiple die; and stacking chutes employed to facilitate storing, packing or assembling. Another feature is the automatic press stop device which shuts off in the event of a miss hit or when a coil end is reached.

The cost of building dies for a dieing machine may exceed twice what it would cost for conventional hand fed press dies. This is due to the increased size of the die, individual station timing, precision assembly and the cost of any additional operation or operations necessary to insure the success of the die.

The inclusion of extra stations is planned when there is any doubt concerning the ability of a station to perform its assigned operational task. Thus the extra station being in reserve, can be employed later to correct any functional deficiency in the sequence of operations. In such cases the extra or dummy station (or stations) is situated immediately following the station (or stations) where trouble is anticipated. Too much stress cannot be made of this design feature.

There are a number of different types of cutouts used in automatic drawing dies. The following cutouts are the most popular, having been successfully employed in automatic drawing die work.

In the line drawings the white areas represent the stock strip. The dark areas and lines represent the cutouts and drawn shapes.

Some typical photographic examples of stampings produced under the different cutout methods employed accompany the line drawings.

Slit Cutout
(Figure 1)

The first style of cutout is the slit type used primarily on shallow draws of light metals. It is the most economical to make

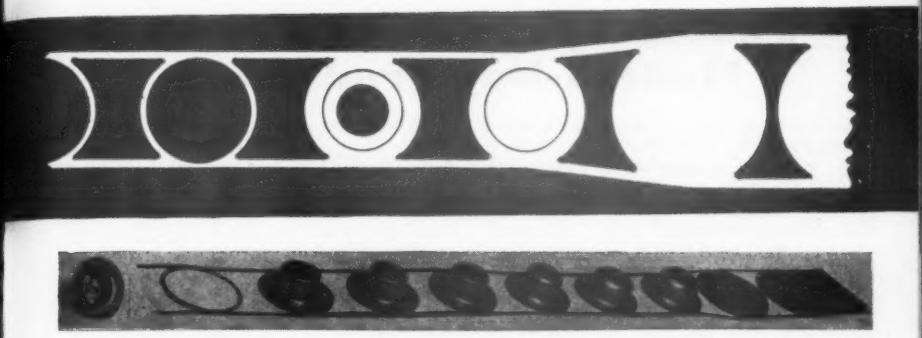
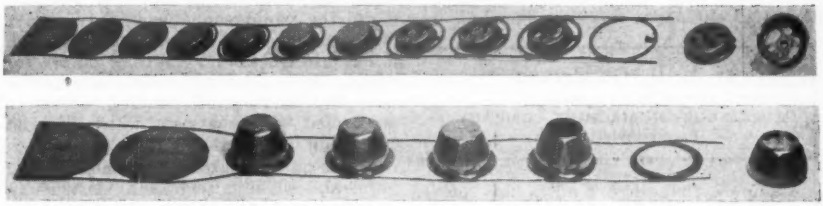


Fig. 3. Dog-Bone Cutout.



and maintain. Its disadvantage is that if the draw is severe the slit will tear out through the stock and thus the carrying strip will be severed.

Slot Cutout
(Figure 2)

The second style is the slot type used on shallow draws. It is also simple to make and maintain. The advantage of this cutout over the slit type is that the punch ends are radii, and so, during the drawing operation, as the bordering metal is subjected to changes ranging from compression to tension there is less chance that the carrying strip will split. However this style uses more material than the slit cutout because of the necessary increase in pitch.

Dog-Bone Cutout
(Figure 3)

The third style is the dog-bone type of cutout. It is the most popular style for draws that are fairly deep. This style lends itself to be made easily on general toolroom equipment. It is strong and substantial but more expensive to make than either the slit or slot style. It has, however, the advantage of providing a blank that is almost severed, and leaves a strong carrying strip or web which can take a lot of punishment without tearing.

Slit Dog-Bone Cutout
(Figure 4)

The fourth is the slit dog-bone cutout. It is a combination of the dog-bone and slit punching designs, and is made in two stations. This style of cutout produces the most economical method of making the blank for fairly deep draws. It reduces the blank size by saving the material ordinarily lost as scrap in the dog-bone cutout. If a small cup is being produced, this material loss might amount to a sizeable portion in relation to the blank size.

Single Round Notched Cutout
(Figure 5)

The fifth is the single round notched cut out. This style is employed in shallow draws of thin metal. It is used only on single gang dies, for it relies on the gathering of stock from the (width) sides

(Continued on page 73)

Pantography and Its Place in Modern-Day Production

According to the latest abridgement of Webster's New International Dictionary, there is no such thing as a pantograph machine. This fact, however, hasn't bothered the metalworking and plastic fields very much because there are a great many of these machines in use throughout the world. Also, according to the dictionary, the two root words "panto" and "graph" will be of little help. But regardless of our word scholars, the term "pantography"—which more clearly applies to a method than a machine—is widely known to engineers and shop men.

by **A. D. Gunderson**
Chief Tool Engineer
GEORGE GORTON MACHINE COMPANY
Racine, Wisconsin

Assuming that most readers are more interested in methods and results than in the physical construction details of a typical pantograph machine, such a machine will be described only to the extent necessary to explain the method.

First, a brief definition which adequately describes the pantograph machine of today is as follows: "A high speed vertical spindle machine used to mill or engrave in metal or plastics to precision standards through means of a reduction ratio." Note this clause, "precision standards". We will elaborate on it later in this article.

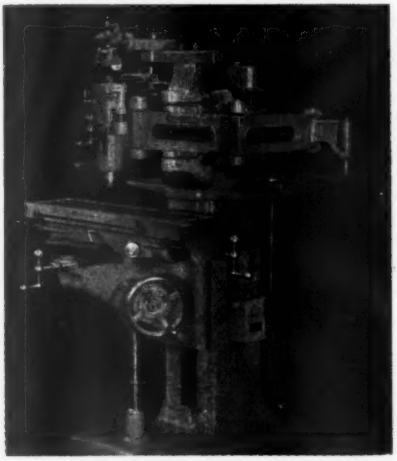
Traditionally, the pantograph has been a small machine designed for work of limited size. This one fact has had much to do with the present lack of appreciation of the possibilities inherent in pantography.

It is a known fact that as far back as 1825, a small pantograph was designed and used to produce engraved medalions for the British government. This machine has been called the first pantograph machine, for lack of exact knowledge of any others that might have been developed elsewhere and perhaps at earlier date. It was built by William Buffham of Rochdale, England, whose grandson, George Gorton II of Racine, Wisconsin, in the late 90's also began to build pantograph machines after securing the American patent rights from an English toolmaking firm.

The original name "pantograph engraving machine" is not at all appropriate today, due to the variety of work accomplished by pantograph machines in almost every segment of industry. Furthermore, the pantograph never did engrave in the strict sense of the term. Rather, it has always used a rotating cutter for milling or machining metal in contrast with the carving or gouging operation performed with a graver, which is what engraving really is.

It was quite natural that manufacturing jewelers, silversmiths, and instrument makers were among the first buyers of the pantograph. Today, the small models are still being used to advantage by these groups, but pantography has developed

Fig. 1. A standard P-32 pantograph machine, with ratios from 1:1 to 6:1, built for heavy profiling operations including die and mold work.



This article is adapted from a paper delivered by Mr. Gunderson at a recent meeting of the Chicago Chapter, ASTE.

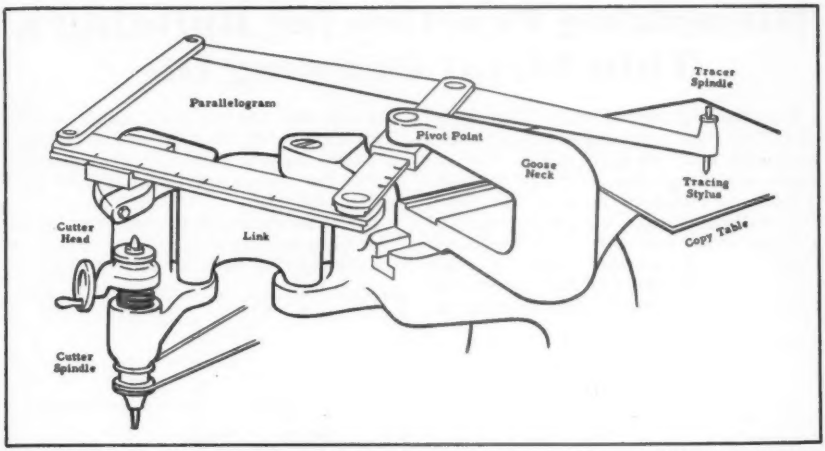


Fig. 2. Basic type of pantograph mechanism. Pantograph is mounted on machine base fitted to cutter head and link.

far beyond this limited field and in many directions so that new applications are being discovered almost daily.

Just preceding the first world war, automobile tire builders discovered the pantograph to be ideally suited for the job of cutting tread design in tire molds at a substantial saving in cost. Far from being a fragile or delicate machine, each of these rugged pantographs weighed around 18,000 lbs.

The next most important factor in establishing the pantograph as an important machine tool were developments in the field of die-casting and plastics. Both of these fast growing industries quickly saw possibilities in pantography in the making of dies and molds, Figure 1. Faster work to closer limits performed by operators who need not be skilled diemakers . . . all added up to lower cost.

The increasing size and importance of the die-casting and plastics industries have helped the general industrial public to become better acquainted with pantographs; however, there are even now many operations being performed in industrial plants which could be handled to better advantage by pantography.

As machine builders and industry in general came to appreciate the latent possibilities in pantography, this branch of manufacturing grew accordingly. Today there are a number of well-known builders of pantograph machines located in England, Germany, France, Switzerland, and Italy, as well as a half dozen in this country.

Going back to the definition of a pantograph, in which it is called a high-speed vertical machine, it would seem to have the characteristics of a conventional vertical mill. However, the conventional vertical milling machine has a fixed spindle and a movable work table. The pantograph normally has a movable spindle and a fixed work table and, in addition, a fixed copy or master table. Both the work table and the master table can be adjusted laterally and vertically, but they are usually locked in position during operation.

Pantograph Mechanism

The most important variation from conventional machine tool design is the pantograph mechanism or linkages. These linkages usually consist of four bars which form a parallelogram, as shown in Figure 2. This illustration applies to the Gorton 3-U two-dimensional pantograph, which is of traditional pantograph design, as well as to other make and model pantographs which are of the same general description. Special or limited purpose

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Diemaking Practice for Building a Thin Metal Drawing Die

For blanking and drawing thin metal .010" thick, the technique is different than for metal 1/32" or 3/32" thick. For example, thin metal dies are made, commonly, without clearance between the punch and the cutting ring, one part being hard and the other semi-hard with the punch forced into the cutting ring. In other respects, special practices are observed as will be demonstrated in the following de-

by **Wallace C. Mills**
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tailed explanation of how a typical die has been designed and built successfully.

The die, Figure 1, is for an oblong can cover 3-7/16" x 2-⅞" x 7/16" deep and .010" thick. It is used in an inclined press. The can cover is picked up by the punch, knocked out by a positive knockout, and blown out through the back of the press by a jet of compressed air. Strip stock is fed to the die by hand. The strips are short, about 30" long in can making, slit from sheet stock, but coil stock will work equally as well.

In laying out this die, the designer would first draw an elevation of the part and then lay in the die parts according to the following rules:

Use a liner pin set, all steel preferred. A liner pin set is best for square and irregular shaped blanks, because it is easy to set up in the punch press. If the blank were round, a liner pin set would not be needed.

Mount the center block, the cutting ring, and the blanking punch flush on the surface of the die set with strong dowels. If the blank were round, the die parts could be set concentric with each other by counterboring in the die set and in each round part; but, for square work, the cost would be excessive.

Locate the cutting edge of the cutting ring ⅛" above the top of the center block to allow for wear and sharpening of the die by grinding. The blank size can be computed according to formula. For the present tool it is equal to the total distance over the can cover, except at the four corners where it is less on account of the drawing action. The distance across the corners must be found by trial by the diemaker.

Allow no clearance between the blanking punch and the cutting ring, but taper the cutting ring back ¾° for ⅝" depth as

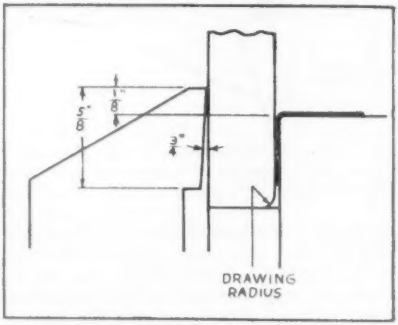

Fig. 2. Blanking punch carries both cutting edge and draw radius.

shown in Figure 2. The draw ring should be ⅝" deep too, so that the top edges of the draw ring and cutting ring are flush when the punch is up.

Clearance between the center block and the inside of the punch should be .0015" plus the thickness of the stock.

The punch should extend into the cutting ring a little beyond the depth of the work. The drawing radius of the punch should be about 5/64", but it must be found by trial as will be explained later.

The punch should be as long as possible within the limits of the available die space. The punch wears more rapidly than the cutting ring because it is semi-hard. It should be long to allow for wear and, also, for as much finger room as possible for the operator to feed the stock. The punch holder should be trimmed to provide additional finger space for the convenience of the operator.

The positive knockout is held up in the punch by a light spring. The shank of this knockout engages a stationary bar through the ram of the punch press on the

(Continued on page 70)

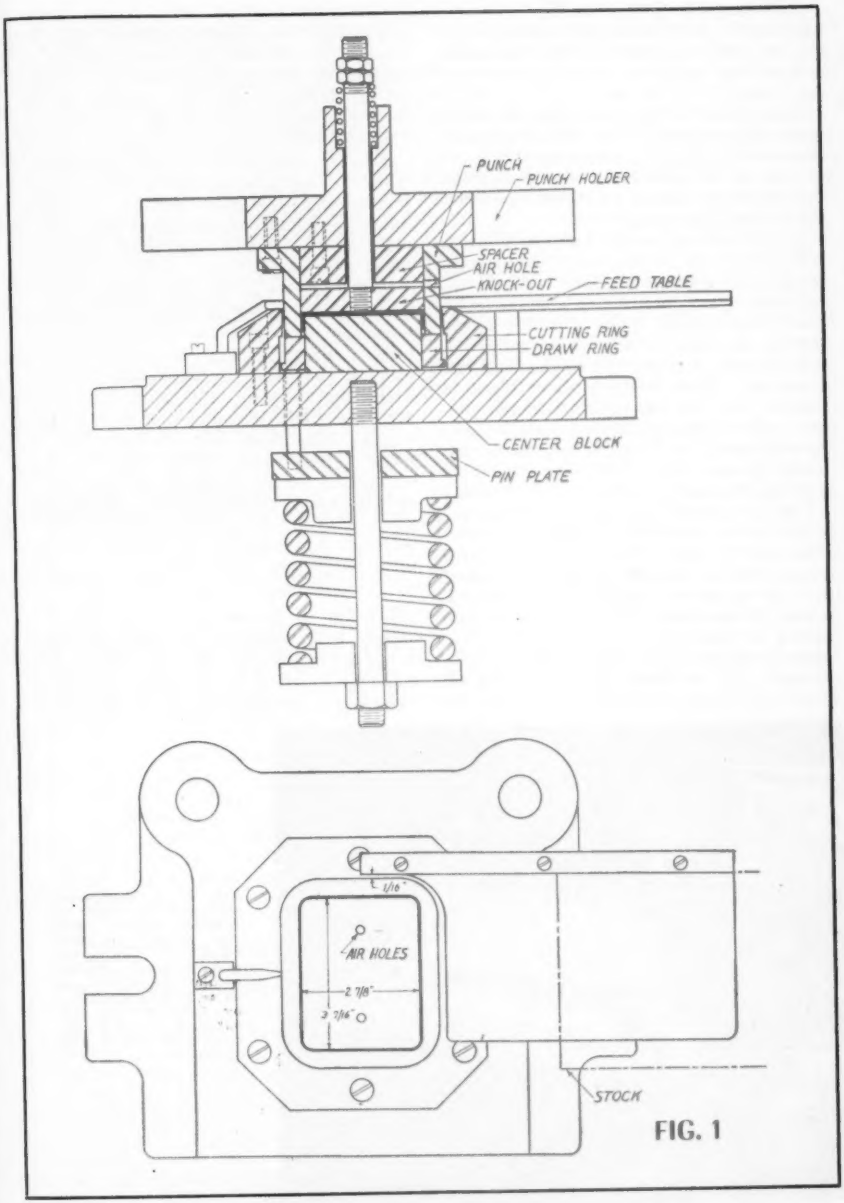
PUNCH
PUNCH HOLDER
SPACER
AIR HOLE
KNOCK-OUT
FEED TABLE
CUTTING RING
DRAW RING
CENTER BLOCK
PIN PLATE
1/16"
AIR HOLES
2 7/8"
3 7/16"
STOCK

FIG. 1

. . . Pantography, from page 65

machines of which the pendulum type is one, as well as some newly designed models, may vary in design or construction details.

Those links which form the parallelogram make possible the reduction ratio between the size of the enlarged master, pattern or template, and the workpiece. This reduction ratio is a specific characteristic of the pantograph.

One of the pantograph bars, or links, is longer than the other three. The tracing stylus is located at the far end of this long bar. Next, the cutter spindle is located immediately under a slider block, which is attached to the pantograph link or bar which runs parallel to the long bar mentioned. Then, another slider block is mounted on the bar which extends between the tracing stylus and cutter spindle and which is at right angles to the tracer spindle bar. This second slider block is attached to a bracket at the central pivot point of the entire mechanism. These three elements — tracer spindle, pivot point, and cutter spindle — must always be in a position so that a straight line can be drawn through their centers in order to produce work which is not deformed or distorted.

Ratios from 1:1 to as great as 100:1 or more are provided by adjustment of both slider blocks to correct positions on the two pantograph bars. These pantograph bars bear engraved calibrations for the ratios of reduction most often required, but almost any ratio of reduction can be arrived at by using a simple formula to locate the slider blocks in their correct positions.

On some three-dimensional pantographs it is necessary to set four slider blocks instead of two. Precise settings are often made with gage blocks after the correct settings have been determined by formula. See Figure 3.

The work table of a pantograph is located below the cutter spindle. This table normally resembles the table on a knee-type milling machine and has T-slots used in clamping the workpiece in place. The master table is located under the area normally covered by the tracing stylus. This table can be flat, with or without T-slots, depending upon the type of master to be used, or it may be a special type of holding fixture. Ordinarily, the kind of master table or holding fixture selected as original equipment is determined by the type of work to be done on the machine.

The aim of the pantograph builder is to design and construct a machine which is rugged enough for the work to be done and one which is as accurate and sensitive as it is possible to make it. Therefore,

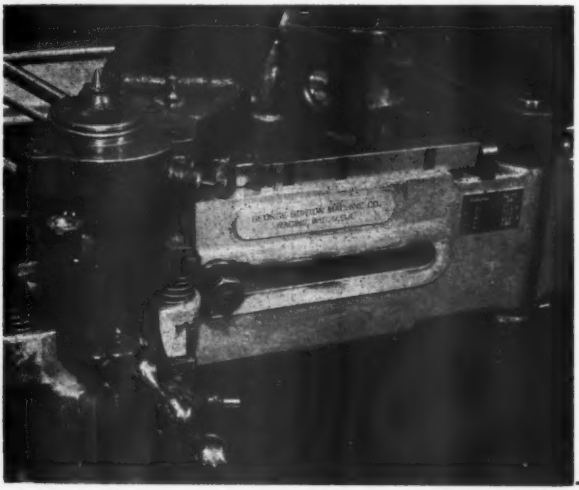

Fig. 3. A heavy-duty pantograph arranged for Jo-block setting. Precise setting of slider blocks, to provide any exact ratio of reduction within range of the machine, is determined first by formula and then obtained on the machine with aid of gage blocks.

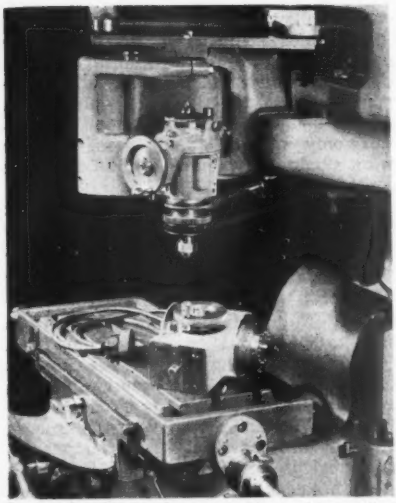

Fig. 4. Standard 3-Z pantograph machine with a belt-driven spindle. Optional high speed spindle, which travels at 45,000 rpm, is shown on table. This spindle operates on 110 volts, developing up to ¼ hp at approximately 26,000 rpm.

almost invariably the pantograph is belt-driven and provides numerous speed changes up to as high as 15,000 or 20,000 rpm. Higher speeds — from 45,000 to 75,000 rpm — can be made available by substituting a direct drive spindle with integral motor, Figure 4, or one of several standard air spindles.

The workpiece or blank is mounted on the work table and the enlarged master is clamped on the master table. The correct ratio of reduction is set by adjustment of the slider blocks, and both cutter and tracer are inserted in cutter and tracer spindles.

Stylus-Cutter Relationship

It is important to emphasize at this point the relationship between the stylus and the cutter. Let us first assume that the ratio of reduction has been set at 10:1 on the machine. This means that the master has been constructed 10 times larger than the workpiece will be when finished. Therefore, the ratio between the tracing operation and the cutting operation must be at a 10:1 reduction also. One method of accomplishing this is to use a tracing stylus 10 times the diameter of the cutter. See solid lines, Figure 5.

When this is impractical, another method is available. The master is enlarged beyond its original 10 times size and the tracing stylus is reduced proportionately in diameter but — and this is important —the center-to-center distance between master and tracer must still remain 10 times the center-to-center distance between cutter and workpiece. See broken lines, Figure 5. Another bit of technique is that of using a slightly over-size stylus for all preliminary cuts. This leaves a small amount of stock on the workpiece until the finish cut is taken, at which time stylus is changed for one of correct proportional size according to one of the two methods just described.

In the past, pantographs have been built to be operated manually, cutting one piece at a time. Today, due to the demand for lower costs and faster production, pantographs are being built in more and more instances with automatic and semi-automatic features, Figure 6. Pneumatic or hydraulic-operated holding fixtures and controls have been employed in numerous instances. Motorized masters, various types of scanning mechanisms, cam-controlled cutter feeds (Fig. 7), and automatic indexing have also been used successfully along with multiple cutter spindles driven by belt from a single motor or by individual motors. On many pantograph models, motorized masters are quickly interchangeable with manually traced masters, thereby adding to the versatility of this machine and minimizing idle time.

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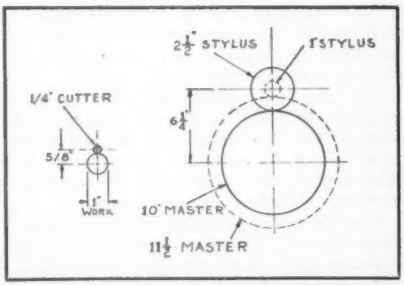


Fig. 5. For a 10:1 reduction, a stylus 10 times the cutter diameter is usually employed. Or, master may be further enlarged and stylus reduced proportionately in size.

. . . Thin Metal, from page 66

upstroke. So, as the knockout stands still while the punch rises, the work is knocked out.

The feed table should be flush with the top of the cutting edge. There will be an adjustable gage located 1/16" back of the cutting edge to allow 1/16" web at the back of the strip. The feed table will be narrower than the strip stock, in order that the operator can hold on to the strip between his fingers without letting go and without laying it down on the feed table and pushing it. This is indicated by the plan view, Figure 1.

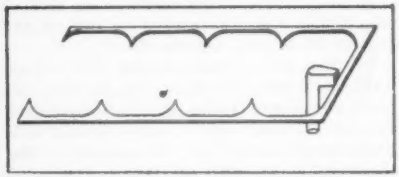


Fig. 3. End gage stops stock along shear lines.

There is no stripper. There might be a positive stripper, or a spring stripper, as in conventional die design; but, higher production speed is possible if the stock is run "Pull through" without a stripper. In the "Pull through" method, the end stop is set flush with the cutting edge so as to cause the stock to break through without a web between blanks, as in Figure 3. The operator just pulls the stock up against the stop by pulling on the front web of the strip, and lifts the web at the end of the strip over the gage with a quick upward pull. It takes a little practice, of course. "Pull through" is used for high production but it is not foolproof, because, if the operator fails to pull the stock up against the stop properly, there will be a nick in the blank.

Pin plate pins should support the draw ring at the four corners for square work, because there is more wear at the corners than along the sides on account of the drawing action. This point is more important in large dies.

Screws for the cutting ring should extend downward with the threads in the die set, and screws for the punch should extend upward with threads in the punch holder. It will then be possible to remove the cutting ring or punch for sharpening while the die is in the press.

Air holes should be provided in the punch and center block. The air holes in the center block should be placed symmetrically, so that the air will flow in evenly under the drawn blank. If there were only one air hole, off to one side, the work would tilt when coming off from the center block.

The heavy drawing spring underneath the die will be selected when the die is built. If it is too weak, the stock will wrinkle; if too strong, the stock will tear.

Tool Materials

Cutting Ring. High-chrome, high-carbon steel for long runs, or oil hardening steel for dies that will have less usage. Harden to 62 Rockwell "C", grind top and bottom, and pencil grind the ¾° taper inside.

Punch. Water hardening steel, hardened in oil to 42 Rockwell "C". Water hardening steel is preferred to oil hardening steel, because it expands when hardened, whereas oil hardening steel is more apt to contract. When the steel expands, high spots and score marks can be ground off. Grind the top and bottom of the punch, and lap the punch against the draw ring.

Draw Ring. Oil hardening steel, hardened to 56 Rockwell "C". Grind top and bottom, and lap against the punch.

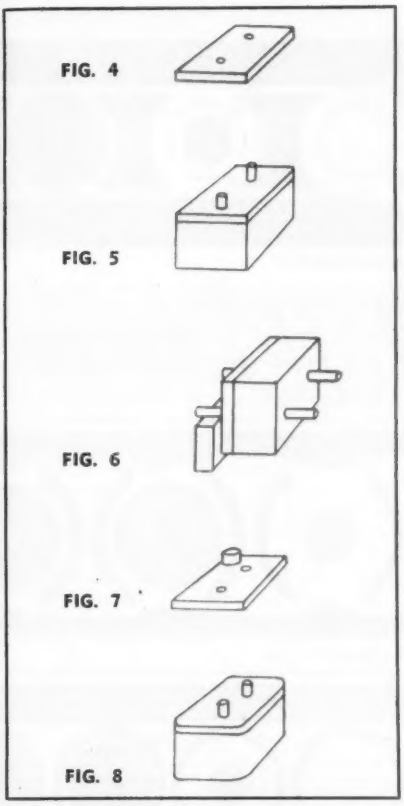
Center block. Oil hardening steel, hardened to 56 Rockwell "C" Grind top and bottom and four sides.

Sharpening the die. When the semi-hard punch becomes dull, it is peened while in the press by striking it with a flat steel bar. The punch is then forced into the cutting ring. At intervals, both the punch and the cutting ring are removed from the die and are surface ground.

Other Die Details

Further information on several of the foregoing points is given here, because it helps in understanding the working of the die in explaining the steps in toolmaking that are to follow.

Clearance between center block and punch. The clearance has been given as .0015" plus the nominal thickness of the stock. The stock varies + .001" to — .001". If the die is too tight, the diemaker should open up the punch when building the die. Too little clearance tears or scores the



Evolution in construction of the center block, over which the oblong cover is drawn. A master is used to facilitate high accuracy required.

stock. Too much clearance causes wrinkles. There will be a slight outward flare of the edge of the drawn shell on account of the clearance.

Drawing radius on the punch. The drawing radius has been given as approximately 5/64" to be found exactly by trial. For deeper draws, the radius will be larger. Too sharp a drawing radius tears the stock, and too sharp a radius stretches the stock causing the depth of the draw to vary in different samples. Too large a radius causes wrinkles. Whatever radius is used, it should be uniform all around the mouth of the punch including the corners and sides. Otherwise, the punch will be hard to sharpen. A large radius makes the work cling inside of the punch, and a small radius may make it stick to the center block. The drawing radius should be highly polished.

Rules for Toolmaking

Use master plates as follows:

For the center block,

1. Make a master of ¼"-thick ground stock. Rough finish slightly oversize, and drill two holes, Figure 4.

2. Rough finish the center block, oversize, Figure 5. Drill two pin holes clear through from the master. These holes will be air holes in the finished die. Insert two pins through the assembly of the master and the center block. These pins will be very useful in building the die, for locating blanks in trial draws.

3. Grind one side of the master and center block together to the proper dimension. Grind one end and then the other with the pins central, Figure 6.

4. Solder a button on the master, and finish one corner radius, Figure 7. Then solder the button on the other corners, and finish the other three corners in the same way. Coat the master with copper for sensitiveness when using the master in the next step to finish the center block.

5. Finish the four corners of the center block from the master, Figure 8.

For the punch,

1. Make a master for the inside of the punch. Rough finish oversize. Drill two holes from the master for the center block. Assemble the master for the punch on the center block, Figure 9. Finish width and length of the master larger than the center block by .0015" plus thickness of the stock.

2. Solder a button on one corner of the master, and finish the master flush with the button, Figure 10. Finish the other three corners in the same way. The button should be large enough in diameter to allow for the .0015" plus thickness of stock. Harden the master.

3. Make the punch oversize, about ⅛" in length and width. Grind top and bottom. Mark the inside contour of the punch from the master, Figure 11. Fasten buttons flush with the four corners of the scribed mark, and bore the four corners

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. . . Cutouts, from page 63

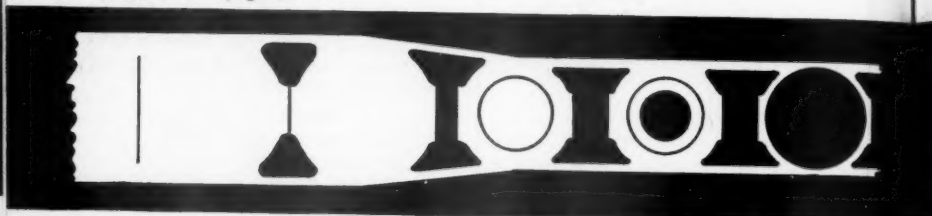


Fig. 4. Slit Dog-Bone Cutout.

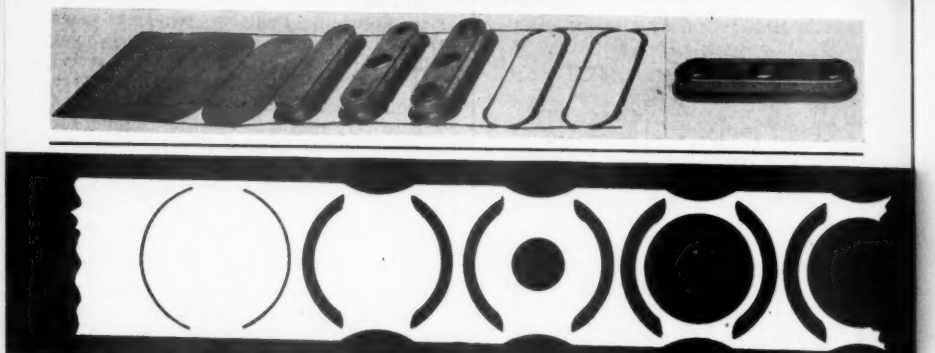


Fig. 5. Single Round Notched Cutout.

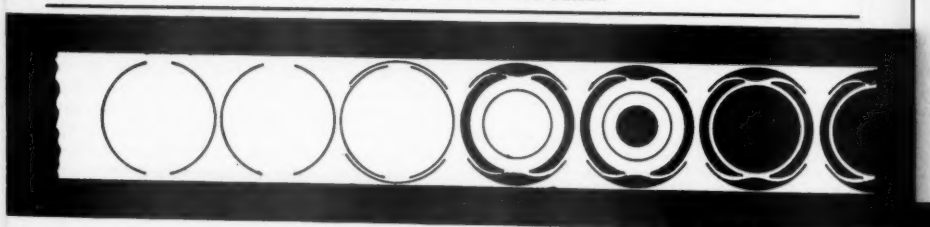
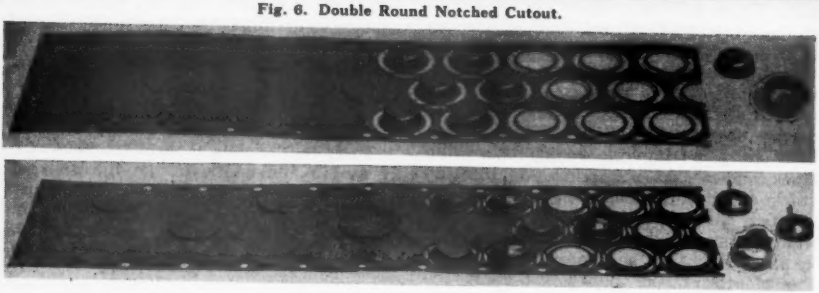


Fig. 6. Double Round Notched Cutout.



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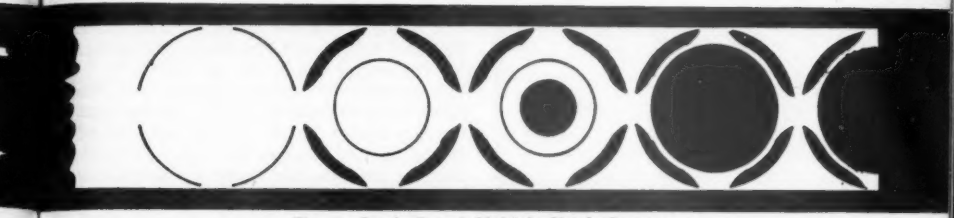

Fig. 7. Single Round Multiple Notch Cutout.

of the material during the draw. Note resultant shape of strip.

Double Round Notched Cutout (Figure 6)

The sixth is the double round notched style. It is very popular in fairly deep draws. It is simple to make and maintain. Its greatest advantage is that it lends itself to multiple gang blanking with great stock economy because of its interlaid layout. Each punch is notched in two places. As shown, the notches appear on diametrically opposed sides of the two punches that are required to produce this type of cutout. No movement takes place from the (width) sides of the material, hence the edges of the strip remain straight and parallel.

Single Round Multiple Notch Cutout (Figure 7)

The seventh is the single round multiple notch cutout which is used on shallow draws of light metal. This style can be used to advantage on either single or multiple dies. The punch may be notched in four or more places. Obviously, the cutout is severed only in those places where the notch does not appear.

Accordion Cutout (Figure 8)

Number eight is the accordion cutout, so called because the "pleat" straightens out thus providing the extra web length that is needed in deep cup drawing. It is a more complicated two station style of cutout. Extreme caution must be exercised that the size of blank will produce a cup with enough scrap so that the cup will be trimmed completely around as it is cut from the strip.

Worm and Dog-Bone Combination Cutout (Figure 9)

The ninth is the worm and dog-bone combination cutout used in the multiple gang automatic blanking of fairly deep drawn cups of heavy or light materials.

(Continued on page 90)

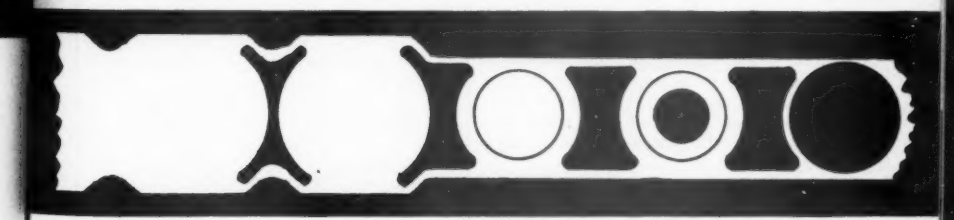

Fig. 8. Accordion Cutout.

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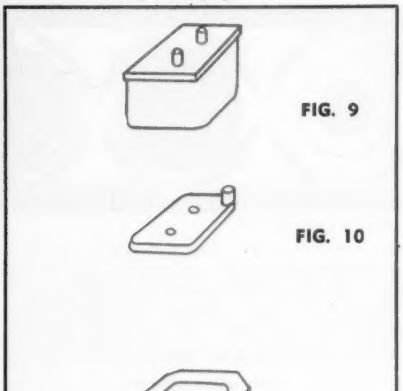


Evolution in construction of the blanking punch, the inside edge of which carries the draw radius.

from the buttons. Rough finish the sides and ends to the mark. Make the drawing radius about 5/64" around the mouth of the punch. Press the master into the mouth of the punch, and finish the inside of the punch to the mark left by the master.

4. Partial assembly comes next. Assemble the center block, draw ring, pin plate, and draw spring in the die set. Clamp the punch in place, locating it by strips of sheet metal on the center block. Draw some sheet metal of the required thickness. Relieve the inside of the punch if it is too tight.

For finding the blank size,

1. Cut several rectangular blanks about the size of the punch, and drill two holes from the master for the center block, Figure 12.

2. Fit one of the blanks over the pins in the center block. Find the blank size by trial for two sides and one corner, Figure 13. Several trials and draws in the die will be necessary.

3. Make a master plate for the blank size and drill two holes from the master for the center block, Figure 14.

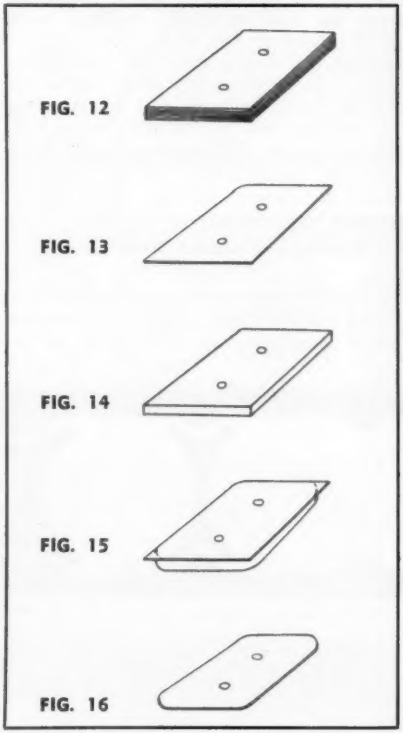
4. Mount the master plate and the blank with one corner finished on the pins for the center block. Finish one corner of the master, Figure 15, turn the blank over on the pins, and finish the remaining corners and sides of the master.

5. Make several blanks of the sheet metal to be used, Figure 16, and draw them in the die. If there are high spots (ears) on the edge of the drawn blank, relieve the punch.

For the cutting ring,

1. Make the cutting ring from stock ground top and bottom.

Principal steps required in finding trial blank size, using a master for uniformity of corners.



2. Mark the cutting ring from the master.

3. Finish .005" smaller than the master all around.

4. Perform other operations needed such as counterboring, drilling for screws, hardening.

5. Grind the ¾° taper with a pencil grinder to fit the master, and locate the cutting ring on the die by means of the master mounted on the pins in the center block.

For finishing the punch,

1. Put solder on the end of the punch and force it into the cutting ring.

2. Finish the punch to the line, permitting the punch to slip into the cutting ring.

3. Peen the edge of the punch slightly, and force it into the cutting ring.

Assembly of the complete die follows usual practice, subject to consideration for specific details on this particular die, Figure 1. The die will cut clean on .010" stock.

Basic Grinding Research at Mellon Institute

Authoritative information on the fundamental nature of the grinding process and ground surfaces, of considerable importance to both engineers and production management, is becoming increasingly available as the result of basic research being conducted at Mellon Institute, under the L. Leslie Byers Memorial Fellowship sponsored by the Grinding Wheel Institute.

Currently, the research seeks to answer the question: "What happens to a surface when it is ground?" Here are some of the important results of the project to date:

1. Better techniques have been developed for studying the residual or "locked in" stresses in surfaces.[1] The practical importance of such stresses is that they may affect the service life of many important manufactured parts. The effect may be beneficial or detrimental, depending upon the type of stress, its magnitude and location in the part, and the forces to which the part is subjected in use.

2. Considerable information has been obtained through investigation of residual stresses in surfaces generated by abrasive action.[2] Like all mechanical methods of generating surfaces, grinding induces residual stresses.

3. In the case of abrasive wheel grinding, these stresses may be either tensile or compressive, depending upon direction and the depth below the surface. The thickness of the stressed layer, which has varied from about 0.002" to more than 0.040" in experiments conducted to date, depends upon the composition of the steel, its heat treatment, and the severity of the grinding. The highest stresses usually lie well within 0.001" of the surface in this type of grinding.

4. Lapping with loose abrasive induces compressive stresses in steel surfaces which extend a few ten-thousandths of an inch into the metal.

5. Barrel finishing with abrasive grain induces predominantly compressive stresses in steel surfaces.

6. Preliminary studies of residual stresses in glass and plastic have shown that these materials are similar to steel in their reaction to grinding.

7. Valuable information has been accumulated concerning the residual stresses resulting from the heat treatment of steel.[3]

Future plans call for an extension of the experiments to include fatigue studies to determine the effect of grinding stresses upon service life, and methods of alleviating stresses when they are detrimental.

Other research projects, currently in the planning stage, are especially geared to providing useful information on the use of the grinding method in large production operations.

The L. Leslie Byers Memorial Fellowship at Mellon Institute is under the direction of Dr. Harold R. Letner. It is actively supported by the Grinding Wheel Institute, which represents approximately 95% of the leading abrasive wheel manufacturers.

References

[1] "Application of Optical Interference to the Study of Residual Surface Stresses" by H. R. Letner, Volume X, Proceedings of the Society for Experimental Stress Analysis, 1952.

[2] "Grinding and Lapping Stresses in Manganese Oil-Hardening Tool Steel" by H. R. Letner and H. J. Snyder, to be presented at American Society of Mechanical Engineers, New York, Nov. 30-Dec. 5, 1952.

[3] "The Effect of Quenching and Tempering on Residual Stresses in Manganese Oil-Hardening Tool Steel" by H. J. Snyder, presented at American Society for Metals, Philadelphia, October 20-24, 1952.

Metalworking Shapers and Their Uses

Continued*

by John E. Hyler

Handling Other Special Work

Slots to receive plow-bolt tongues are readily cut in bolt-receiving holes with a shaper. Some leading shapers may have automatic power down feed applied either at the factory or in the field. Special tables can also be furnished for shaping large castings, die blocks, and other bulky work. Circular feeding heads are sometimes applied to such machines for concave work, and for machining internal curved surfaces having interruptions.

Most modern shapers are superior to older units due to better design in general, and to new features in particular. One shaper which has long been considered highly efficient has now been provided with a new type of control, consisting of a new electromagnetic clutch and brake, for starting and stopping. This is a very simple and fast control. The ram is positioned quickly and accurately by instant action of the clutch and brake. Starting and stopping is accomplished by just a light touch, a single control lever being placed in a highly convenient position for the operator. The clutch and brake operate without any grab, are powerful and smooth in action, and require no adjustment.

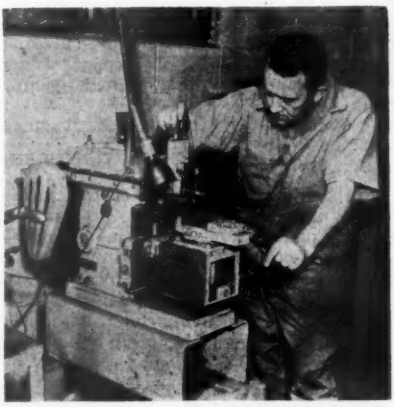


Photo courtesy Atlas Press Co.

Here is an interesting 7" bench shaper in operation. The owner, Albert Christopherson, is a highly-skilled craftsman specializing in tools and dies. Though his shop is small and he uses light bench machines, his products include a 50 ton hydraulic press, and a sheet metal stamping die over 6 feet in length. This die was machined entirely on his Atlas 7" shaper.

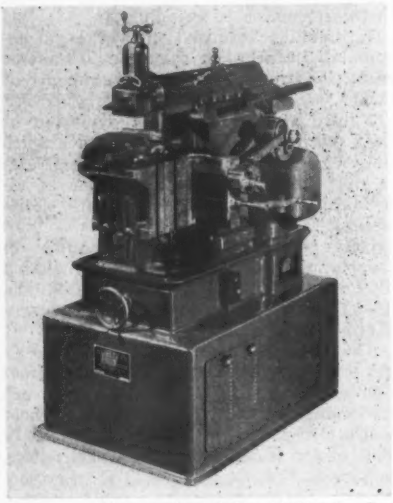


Photo courtesy Sheldon Machine Co., Inc.

This small type shaper is a highly efficient backgeared machine, having a 12½" maximum ram stroke. The ram may be set to make as few as 12 or as many as 180 strokes per minute, and the head has a 4" vertical travel.

Follower-type shapers, based on an adaptation of the standard shaper, have been made available. These are particularly suitable for automatically shaping contours on dies, clamps, cams and other parts. The method employed is very interesting. A master form to be duplicated is

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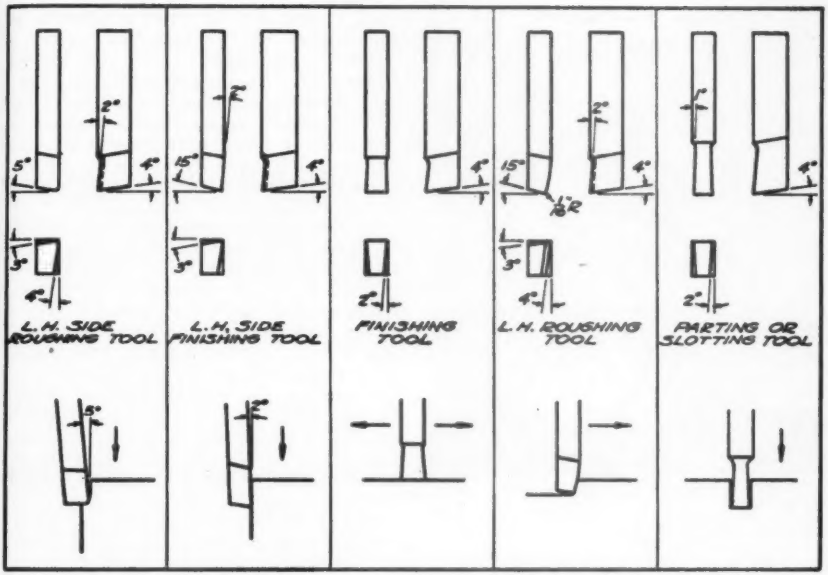
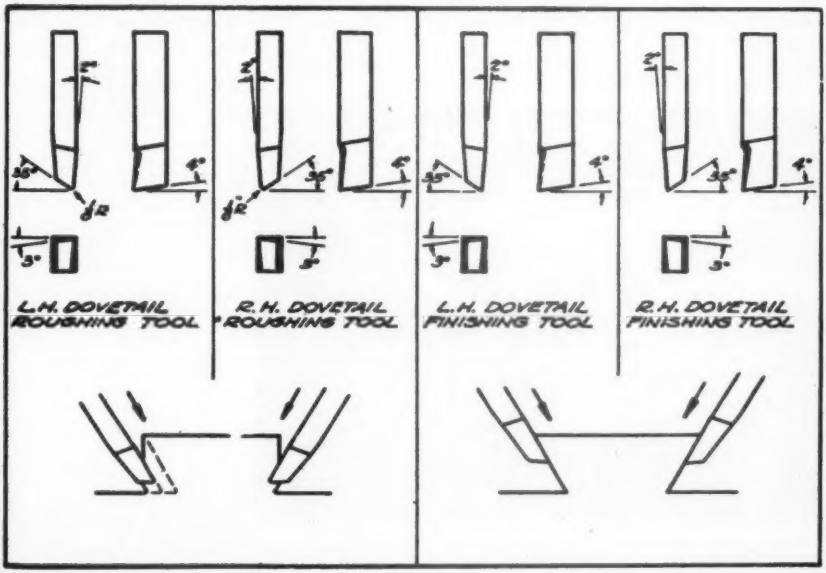
*See pg. 72, TOOLING and PRODUCTION, November 1952.



Drawing courtesy Cincinnati Shaper Co.

Above. The sketches show the recommended cutting tool angles for use in machining mild steel on Cincinnati Shapers. The direction in which the cut is made is indicated.

Below. The cutting tool angles recommended for machining cast iron on Cincinnati Shapers are illustrated. The direction of travel of the tool head in cutting a dovetail is shown.



. . . Pantography, from page 69

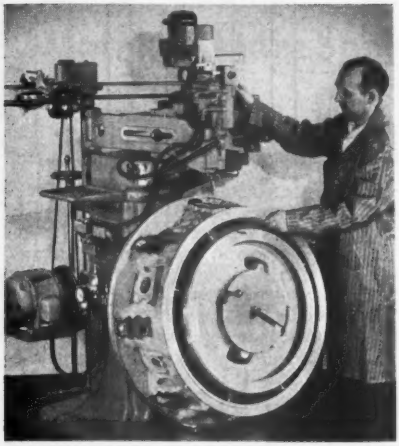


Fig. 6. Semi-automatic operation using pantograph machine for the profiling of eight ports around the periphery of a large aluminum alloy casting. This is a jet engine part.

Range of Application

The question is often asked: "What is the size of a pantograph?" Generally speaking, there is no size limitation. There are table model pantographs weighing from 30 to 50 lbs., and there are pantographs weighing in excess of 10,000 lbs. The scope of work likewise varies widely. A standard model pantograph has been used to engrave the Lord's Prayer—approximately 300 characters— within a circle five-thousandths of an inch (.005") in diameter. Another standard model has been used to mill the intaglic design in scoring plates, which emboss designs in rug pads, of approximately 10' x 20' size. Other models have been used to cut designs on the surface of rolls and cylinders up to 30" diameter x 12' long.

In view of the reduction ratio usually employed, the question naturally comes up as to how large a master must be constructed for such large size workpieces. In cases such as these, perhaps only a section or segment of the over-all design can be used for the master. After completion of one segment, the workpiece or the master or the pantograph itself, Figure 8, is moved to the next position until the entire job is finished. In cases where work is being done on rolls or cylinders, the workpiece is usually indexed to the new position, Figure 9.

Standard model pantographs, or adaptations of them have been used in work on alphabet molds for alphabet soup, breech block and breech rings of heavy artillery pieces, fire interrupter cams for aircraft machine guns, fraternity rings, 18-foot propellers for heavy bombers, table silver, plastic spectacle frames, cookie molds, forging dies and many more diversified products throughout industry, Figure 10.

(Continued on page 82)

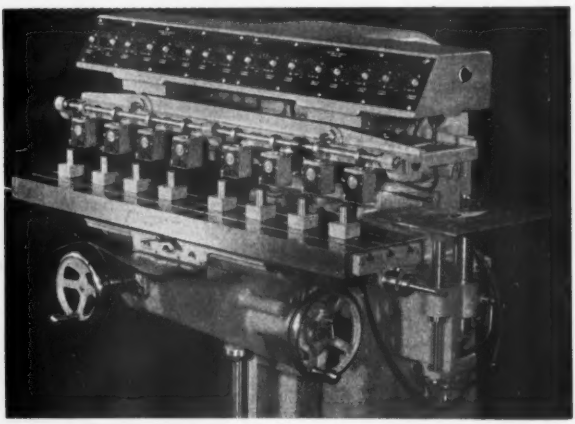


Fig. 7. Eight-spindle etching machine, employing automatic control from a 4:1 fixed ratio pantograph. Etching spindles are individually cam-actuated, for positive feed and to permit fine adjustment necessary for uniform cutting action.

Radius and adjoining face ground simultaneously. This 4" Plain Hydraulic Grinder features a solid table with a short angular section for the headstock, and a combination radius and angular truing attachment.

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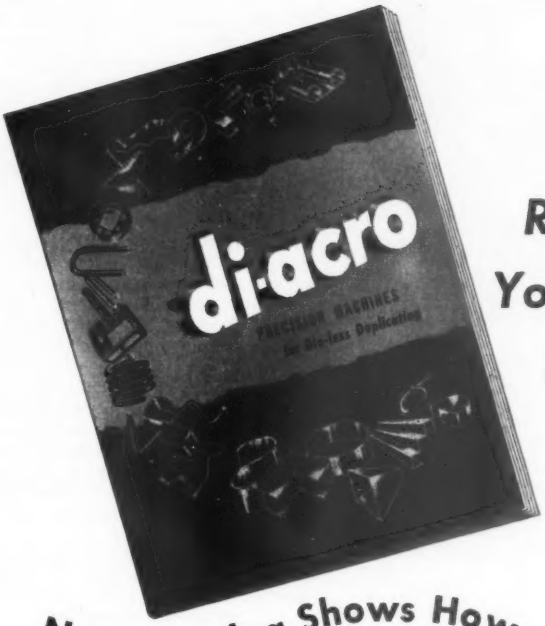
(See page 104 for further gains and comparisons)



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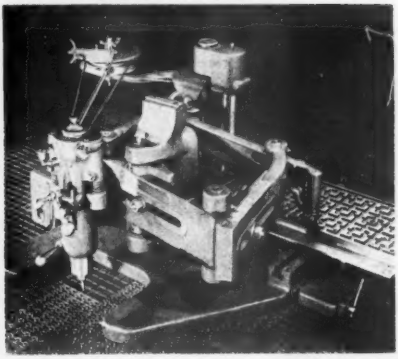

Fig. 8. Special pantograph machine for profiling the form in steam-press plates for embossing rug pads. The plate itself is 14' x 15'. Work is too large for the machine, so the machine is taken to the work.

Speed and accuracy are two of the principal reasons for the growth of pantography. Quick "setup", especially for short runs, is accomplished by constructing a relatively simple enlarged master of wood, brass, aluminum, plastic, or even cardboard in some cases. This master can be complete or merely a segment; it can be flat, curved, or irregular in shape. It is made several times larger than the finished workpiece to tolerances determined by the individual job requirements. When the master is traced by the tracing stylus on the machine, the cutter is actuated by the pantograph linkages working at the ratio of reduction previously set into the machine and follows the exact shape and contours of the master but in the finished size desired. Accuracy and tolerances in the finished workpiece benefit from this reduction ratio.

Pantographic Accuracy

Precision accuracy is a subject full of dynamite unless applied to one specific type of machine working on one specific job at any one time. What may serve satisfactorily as tolerances in a lathe may be quite different than those expected from a milling machine or boring bar.

Let us first face the fact that no machine is really accurate. It is either as accurate as its performance requires, or it is as accurate as it can be designed and built. The human element, on the one hand, is a factor which contributes to inaccuracy, and the machines and processes used in building the machine in question have inaccuracies of their own. So, even though a machine is designed to be perfect in accuracy, the actual building

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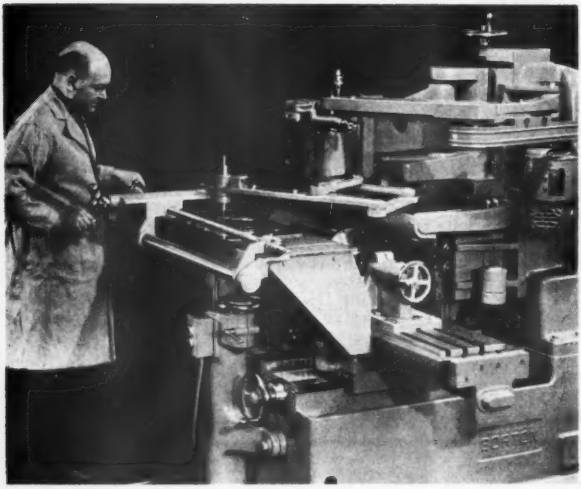

Fig. 9. Special pantograph machine for engraving intricate designs in rolls up to 12" diameter x 40" long. Indexing of roll is synchronized with movement of tracing stylus.

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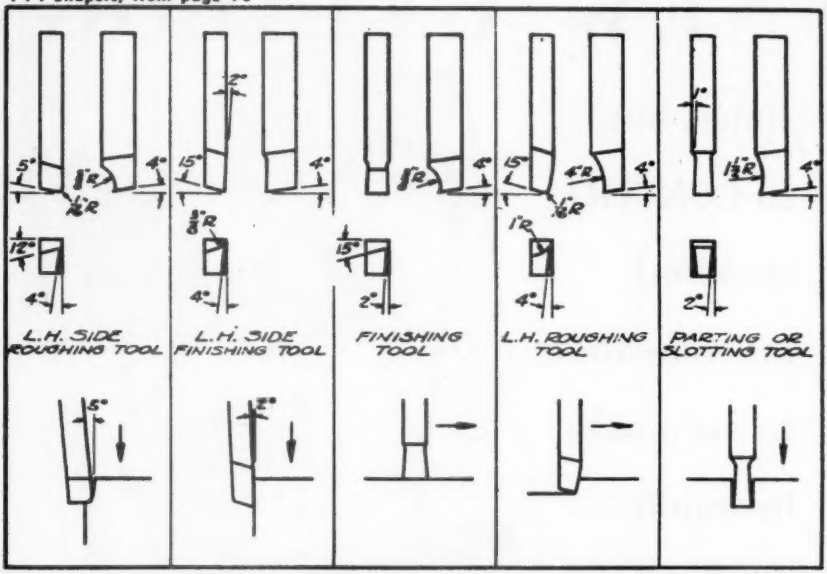

Drawing courtesy Cincinnati Shaper Co.

Recommended tool angles for making vertical and horizontal cuts on cast iron are shown.

Photo courtesy Logan Engineering Co.

This 8" shaper is equipped with a variable-speed device which allows any number of reciprocations of the ram from 35 to 180 per minute. The toolhead vertical travel is 2¾" and may be swiveled 360 degrees.

made of steel about ½" thick, and is clamped in a special holder which is secured to a pad located on the machine base. The rail elevating screw is disconnected and drawn back while a duplicating job is in progress, thus allowing table and rail freedom of vertical motion. The rail and the table are supported on the master form held on the machine base by means of a steel post, equipped with a roller at its lower end.

Roller Follows Form Duplicated

Thus, the roller acts as a follower on the master form, and duplicates that form in the work, with reference to the finished cut. Where cuts of considerable depth are involved, they are made by feeding the tool slide down in consecutive cuts for preliminarily roughing out the work, after which the final finish cut is made with the duplicating attachment. This method is practical in any case where climb angles on the form to be

(Continued on page 96)

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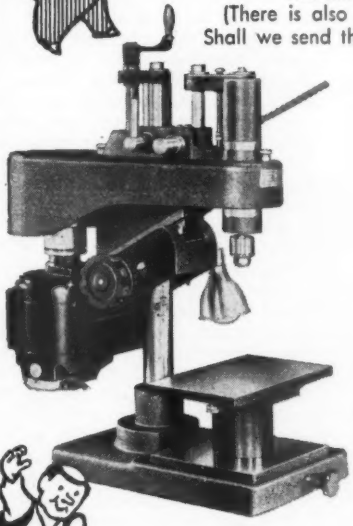

Shown here is the Hamilton Varimatic, Super Sensitive, Variable Speed, Small Hole Drilling Machine, one of four models, each particularly adapted to the work for which intended, all equally precise.

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. . . Pantography, from page 82

of it may not, and usually does not, provide such precision.

The pantograph is just as much subject to inaccuracies contributed by the human element and the machines used in its construction as any other machine tool. However, it has two advantages one of which is not present in any other type of machine.

Fig. 10. Executing a three-dimensional mold for a plastic silverware chest.

In the first place, the pantograph employs a master, pattern, or template. So does a lathe or milling machine which has been fitted with a copying attachment or follower. When operating inaccuracies or errors are discovered and measured in either type of machine, the master may often be altered to compensate for the known operating error. It would be a remarkable achievement to be able to say that this can always be done. The fact is that, in a few cases, this is not possible. The next question is: "What is there about a pantograph which distinguishes it from other machine tools when accuracy is an important issue?"

This is the place where the pantograph demonstrates its unique advantage which is found in no other mechanical device: the pantograph operates at a reduction ratio! This one feature sets it apart from all other machine tools, even including other tracer-controlled machines.

We can say that the pantograph is the only machine that will produce greater accuracy at the cutter point than is fed into the machine at the tracer point.

Whenever it is possible to alter the master to compensate for the operating inaccuracy of a pantograph, we have, as additional help, its reduction ratio. This reduction ratio increases accuracy in direct proportion to the ratio of reduction. Therefore, if the ratio of reduction is 3:1, you will achieve three times the accuracy of the master and three times the accuracy possible with any machine which must operate at a 1:1 ratio. If the ratio of reduction is 10:1, accuracy will be increased 10 times over that of the master or the 1:1 tracer-controlled machine. Naturally, these statements apply only to machines of comparable capacities, weights and sizes.

It is equally important when thinking in terms of high production output to know that a high degree of repetitive accuracy is characteristic of the pantograph. Once the ratio of reduction has been decided upon, the master suitably designed and constructed, the cutter sizes and types determined, the speeds and feeds (when using motorized masters) properly calculated and the number of roughing and finishing cuts established, every single succeeding workpiece coming off the machine, whether ten minutes later or two years later, will be identical to the original workpiece.

From the above, it can be seen that a standard pantograph built by a reputable manufacturer is capable of providing more accuracy in work for which it is fitted than any other type of machine. In addition, there are many operations in the metal-working field today which, because of their shape, size, or inaccessibility, cannot very well be performed on any other machine but a pantograph.

Another advantage of a reduction ratio is that tool and die steels can be readily machined without undue effort on the operator's part because of the well-known principle of leverage. At a 10:1 ratio, the operator exerts only one-tenth the effort which would be necessary at a 1:1 ratio.

A word of caution is advisable. The pantograph is not a "cure-all". It is more complicated than many other conventional machine tools, and it frequently presents

(Continued on page 186)

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the effect of Grinding Wheel Hole Size upon balance, II*

In the first installment of this article Mr. Hudson showed the method followed in computing the resultant out of balance of an eccentrically mounted wheel when the diameter of the wheel hole is larger than the diameter of the shaft upon which it is mounted.

by **Charles J. Hudson**
Abrasive Quality Consultant

This installment continues the discussion and shows the amount of out of balance of the above wheel after rough truing the periphery.

Figure 1 shows the conditions of mounting the wheel eccentrically as discussed in the first installment.

*The first installment of this article appeared in the November 1952 issue of TOOLING and PRODUCTION.

Figure 2 shows the conditions after rough truing.

A large crescent has been removed from the periphery. This is represented by the hatched area AHGL.

The new periphery of the wheel has its center at C which is also the center of the arbor and the center of rotation.

The center of the hole in the wheel is at D. This means that the hole is now off-center with respect to the wheel periphery and center of rotation.

If the truing is carefully done, no wheel material need be removed at a point A. This means that the large crescent AHGL has a zero dimension at the point A, while the width GK is equal to EF which in turn is equal to d-d_1 the difference in diameters

(Continued on page 92)

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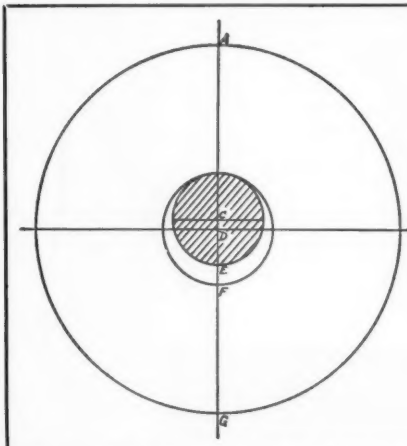


Fig. 1. Wheel mounted eccentrically because of oversize hole.

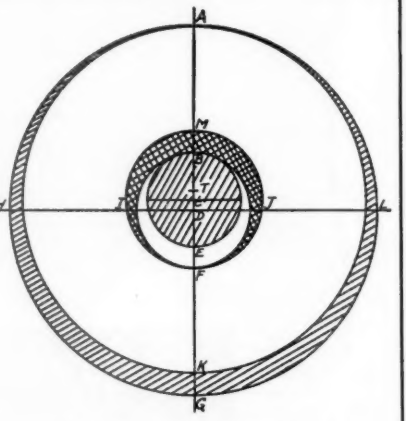
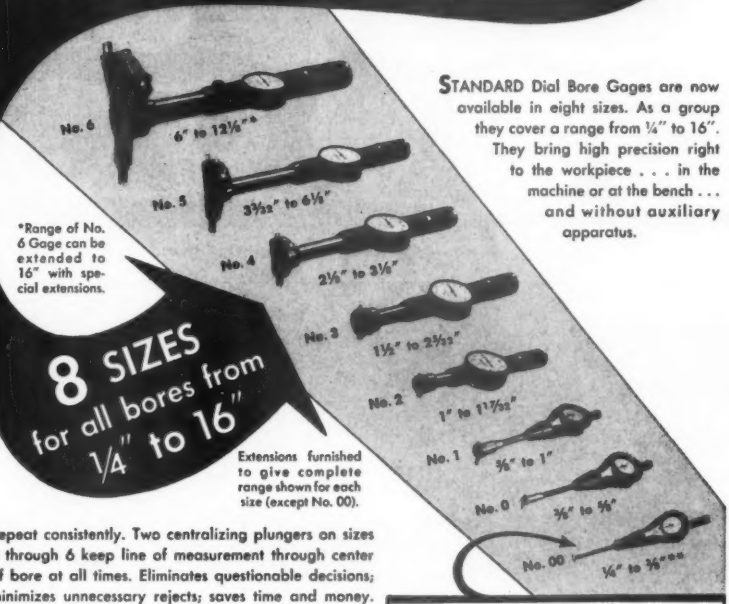


Fig. 2. Same wheel after truing.

Now!... a Wider Range!

STANDARD DIAL BORE GAGES

for Positive, Direct, Precision Measurement



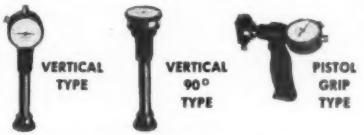
STANDARD Dial Bore Gages are now available in eight sizes. As a group they cover a range from ¼" to 16". They bring high precision right to the workpiece . . . in the machine or at the bench . . . and without auxiliary apparatus.

*Range of No. 6 Gage can be extended to 16" with special extensions.

8 SIZES for all bores from ¼" to 16"

Extensions furnished to give complete range shown for each size (except No. 00).

Repeat consistently. Two centralizing plungers on sizes 0 through 6 keep line of measurement through center of bore at all times. Eliminates questionable decisions; minimizes unnecessary rejects; saves time and money.



In addition to above, special gages available for out-of-ordinary applications.

NEW!

The No. 00 Gage with Centering-size Discs for checking bores ¼" to ⅜" with tolerances up to .005"

**Regularly supplied with a centering-size disc made for dimension specified by user. Discs of other sizes may be readily interchanged. If set of discs is desired, covering complete range of ¼" to ⅜", write for information.

Patent Applied For

WRITE FOR DETAILED INFORMATION

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

. . . Cutouts, from page 73

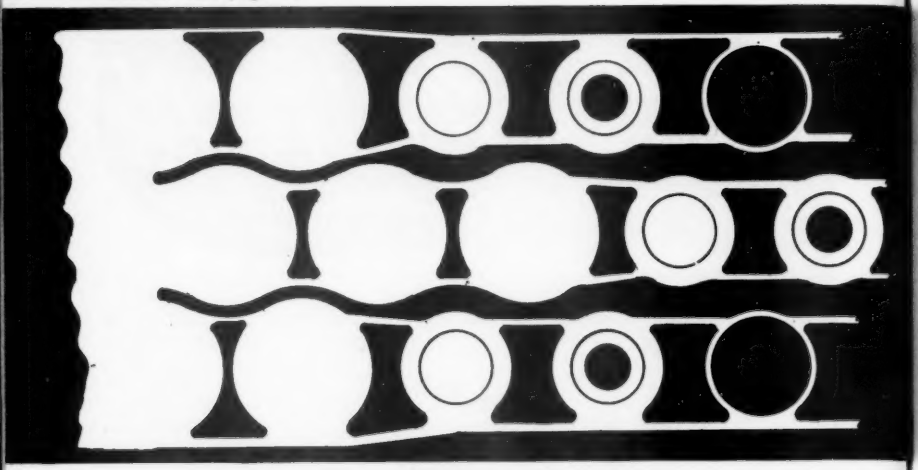


Fig. 9. Worm and Dog-Bone Combination Cutout.

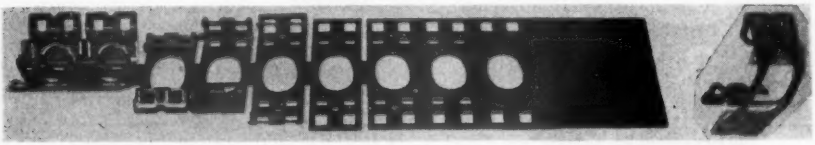


Fig. 10. (above).

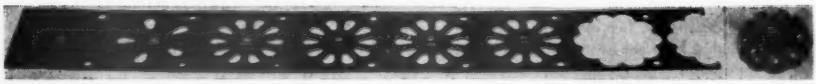


Fig. 11. (below).

This style lends itself to economical blank layout by so staggering the blanks as to get the greatest number of pieces possible from a given amount of material.

Blanking and Forming (Figures 10 and 11)

The dieing machine can be used for simpler types of work than drawn shapes. Examples of this appear in Figures 10 and 11. The workpiece of Figure 10 is a quite complex stamping and forming job done in heavy guage material.

The product shown in Figure 11 is a valve handle, also from heavy stock. This is primarily a forming operation although there is a mild dimple draw which becomes the extruded center hub of the handle. This draw is not so severe as to "call for" material from the outer confines of the strip.

These metal working methods have contributed greatly to the growth of the pressed metal industry by producing vast quantities and varieties of stampings at amazingly low costs.

All Standard Accessories
Ready to Go Immediately
DETROIT DIE SET CORPORATION immediately on receipt of order ships all standard items in a wide range of sizes . . . dowel pins, die springs, stripper bolts, socket grip head cap screws and other accessories. All are nationally known products manufactured with the same precision as "DETROIT" die sets. For dependable shipment, 'phone, wire or write "DETROIT."
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DETROIT DIE SET ★

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

. . . Grinding Wheel, from page 88

of hole and shaft.

Another interesting crescent can be constructed at the hole represented by the cross-hatched area MIFJ. It is formed by drawing a circle with radius CF from the center C. It is the volume and weight of material represented by this crescent which is now responsible for the residual out-of-balance condition of the wheel after truing. The remainder of the wheel, exclusive of this small crescent, is now symmetrical and central with the point of rotation C. By rough truing the wheel periphery and removing the large crescent AHGL, the wheel balance has been improved.

The amount out-of-balance of the trued wheel can be determined if the location of the center of gravity and the weight of this crescent-shaped volume MIFJ can be computed. The center of gravity is located at some point T at a distance CT from the center of rotation. An examination of Figure 2 will indicate that a counterbalance weight must be placed at K in order to put the trued assembly in standing balance. It will be recalled, in the former proposition before truing, that the counterbalance weight had to be placed at the point A.

Another, and perhaps simpler, method of computing the location of the center of gravity of the trued wheel is to consider the entire trued wheel with its hole off-center by the amount CD. The location of the center of gravity from the point on the line CA is

$$CT = \frac{r^2 a}{R_1^2 - r^2} \quad **$$

where

R_1 = radius of trued wheel $= \frac{41.995}{2}$

r = radius of hole $= \frac{12.009}{2}$

r_1 = radius of arbor $= \frac{11.999}{2}$

$a = CD = r - r_1 = .005$

Substituting the above values in the formula we have

**See "Elementary Calculus" by Woods & Bailey, Revised Edition, Ginn & Co. 1928 for the derivation of this formula. This same formula can be derived geometrically without the use of calculus.

Fig. 3. Testing for balance.

$$CT = \frac{6.0045^2 \times .005}{20.9975^2 - 6.0045^2} = .0004''$$

Knowing the distance CT, the counterbalance weight W_1 at the point K to put the assembly in standing balance can now be computed from the following formula:

$$W \times CT = W_1 \times KT$$

where W = weight of trued wheel = 184.95 lbs.

$CT = .0004''$

$KT = R_1 + CT = 20.9975 + .0004 = 20.9979''$

$W_1 = .0035$ lbs. $= .056$ oz.

Obviously this counterbalance weight cannot be applied at the periphery but should be applied by counterbalance weights in the balancing flanges of the grinding machine. If the center of gravity of the counterbalance weights is at a point r_2 from the center of rotation then this weight becomes $W_1 \times \frac{R_1}{r_2}$ and if $r_2 = 3''$ then the total weight in the balancing

(Continued on page 116)

Tracer Controlled Machining Applied To Milling

MR. DUPLICATOR says — "Walker — can you put duplicators on these foreign milling machines that are flooding the country?"

WALKER says — "Yes, Mr. Duplicator — we have placed Walker hydraulic duplicators on a quite a number of foreign-made mills. A typical application is the two dimension duplicator shown on the French made DUFOUR mill pictured above.

We have arrangements with many foreign manufacturers whereby their mills and lathes can have the Walker hydraulic duplicator attached for one, two or three dimension duplicating.

The Walker duplicator for the lathe is so far superior to the foreign models that there is no comparison.

WE BUILD THE BEST. We have built more hydraulic duplicators than all the foreign manufacturers put together.

In addition to building duplicators for all sizes of boring mills, milling machines, lathes, planers, shapers, grinders and special purpose machines, WALKER builds duplicators for small machines, such as high speed heads.

Send sketch of parts and name of machine for immediate information. Write for descriptive folder.

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Pioneer Designers and Builders of Precision Duplicating Equipment

DIECO Die Sets
1728 Combinations
All-Steel Semi-Steel
special and standard

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500 Stock Sizes
3 pressures:
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for Finer Precision, Higher Quality for Better Production, Bigger Profits

Performance is proof! DIECO customers report: "Smoother operating DIECO Die Sets boost production. Need no prybars. Longer die life. Less down time. DIECO Die Sets are manufactured by Die Supply in Cleveland—means better service! DIECO Guide Pins, Bushings, and Components interchangeable with finest precision fit—operate better, longer. DIECO Springs outperform others 3 to 1 *and better*. Greater travel, more usable pressure, longer life. Demand DIECO for *all* your tool, die and machine shop accessories. Ask for catalogs.

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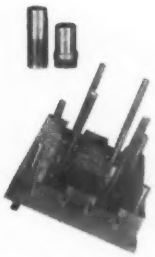
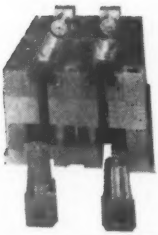
WHAT NEW JOBS HAVE SPEED STEELS FOUND?





How All Three Speed Steels Make Plastic Pipe More "Flexible"

Carlon is a plastic pipe used to transmit fluids and vapors over irregular surfaces. This Speed Steel Mold—using Holliday's Speed Case (X1515), Speed Treat (X1545) and Speed Alloy hot rolled alloy plate steel helps make Carlon even more "flexible". It molds 6" dia. threaded plastic couplings that join either long lengths of Carlon to Carlon or Carlon to standard metal pipe.

Naturally, these couplings have to be near-perfect to prevent leakage. Carlon Products Corp. reports top distortion-free production at the rate of one shot per minute. Houk Machine Company, Barberton, Ohio who made the mold of Speed Steels for Carlon, reports 40% faster machining than regular hot rolled carbon or tool steels plus an absence of warpage and distortion and longer tool life. Top and bottom plates are of ground Speed Treat plate, male and female core are of Speed Case carburized to Rockwell 55 "C" then ground to size. Other parts are of Speed Alloy.

How versatile Speed Steels are solving new fabricating problems every day makes mighty profitable listening. Check with your Speed Steel distributor or write direct for literature.

SPEED STEELS

SINCE 1856
W. J. HOLLIDAY & CO.
(INC.)

SPEED ALLOY ■ SPEED CASE ■ SPEED TREAT

DISTRIBUTED BY

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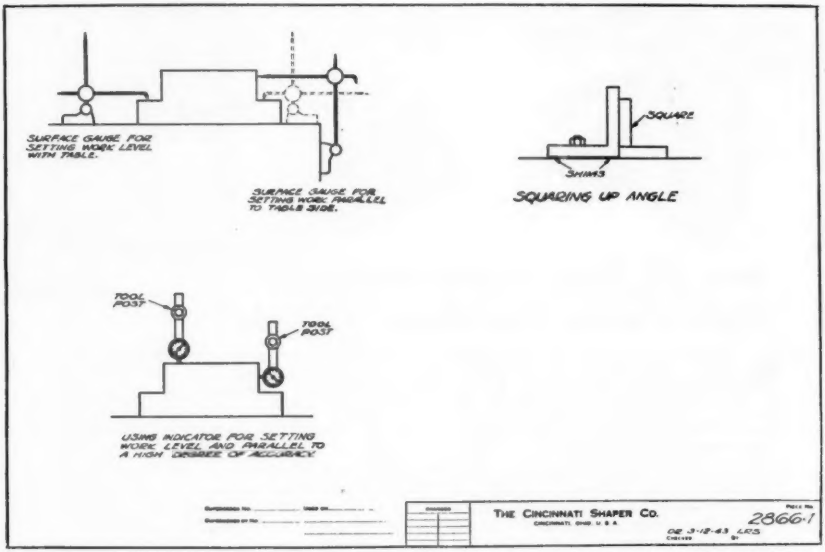
Produced by W. J. Holliday & Co., Inc., Speed Steel Plate Division, Hammond, Indiana. Plants: Hammond and Indianapolis, Indiana

. . . Shapers, from page 84


SURFACE GAUGE FOR SETTING WORK LEVEL WITH TABLE.
SURFACE GAUGE FOR SETTING WORK PARALLEL TO TABLE SIDE.
SQUARE
SHIMS
SQUARING UP ANGLE
TOOL POST
TOOL POST
USING INDICATOR FOR SETTING WORK LEVEL AND PARALLEL TO A HIGH DEGREE OF ACCURACY
THE CINCINNATI SHAPER CO.
CINCINNATI, OHIO, U. S. A.
2866-1

Drawing courtesy Cincinnati Shaper Co.

The application of surface gages, squares and dial indicators in making work setups are illustrated.

negotiated by the roller do not exceed an angular departure from horizontal in excess of 20 degrees.

Compound curved work is now readily produced on shapers and shaper-planers by hydraulic tracing systems. This involves use of master pattern, contour of which may be and is copied onto the workpiece. This extends the scope of modern shapers to machining many types of highly complex work.

Use of suitable shaper gages for setting shaper tools is imperative for quality operation. Every shaper operator should be provided with a gage of this type. The gage itself is set with a micrometer before being used in connection with a given job at the machine. There are various reputable sources for such gages.

It is always worth while to give careful consideration to work holding accessories and equipment for use with a metal working shaper. While a large amount of work may be held in shaper vises, and while

(Continued on page 100)

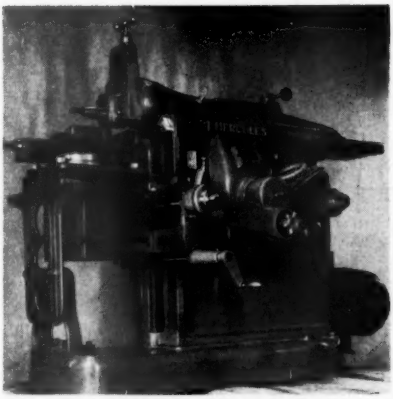


Photo courtesy Parker Machine Co., Inc.

The 16" shaper shown is one of two models built by the manufacturer, the other size being a 22" machine. These machines have 6 different ram speeds ranging from 24 to 152 strokes per minute. A rotating plate indicates the various ram speeds.

IF YOU GRIND, POLISH, DEBURR...

FLAT OR IRREGULAR SURFACES....
HARD METALS OR SOFT....

THERE'S A Hammond ABRASIVE BELT GRINDER

TO FIT YOUR NEED!

SEND SAMPLES — New - Better - Faster Grinding, Polishing, Buffing, and Deburring Machinery is being developed continually here at Kalamazoo. Our Processing Dept. is equipped with 35 modern Hand, Semi-Automatic and Automatic Abrasive Belt Grinders.

Write for Catalog D75, and send one rough and one finished sample for an Engineering Report — no obligation.

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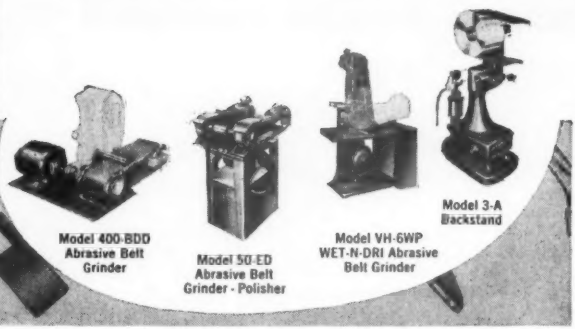


Model 400-BDD Abrasive Belt Grinder

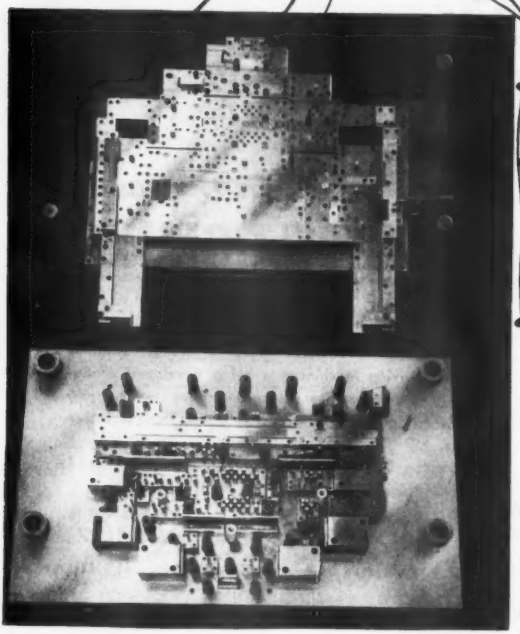
Model 50-ED Abrasive Belt Grinder - Polisher

Model VH-6WP WET-N-DRI Abrasive Belt Grinder

Model 3-A Backstand

AUTO RADIO CHASSIS "WRAP-AROUND" CASE

produced complete



WITH THIS BARTH SEVEN-STAGE DIE

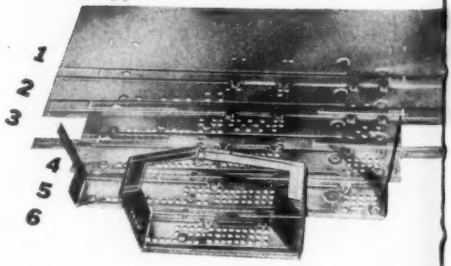
THIS ONE DIE, in one, continuous 7-stage operation, turns out the finished "wrap-around" case for a popular automobile radio chassis.

Once the sheet steel is fed into the die, no further handling is required. The entire punching, shearing, piercing, forming and finishing job from sheet to finished piece, is accomplished automatically, efficiently, economically.

There is no surer way to achieve leadership in sales and profits than to be constantly aggressive in the search for means of simplifying, combining, improving and converting manual to automatic operations.

Let Barth help you achieve this. Write for the Barth Catalogue.

HERE ARE THE SEVEN STAGES!



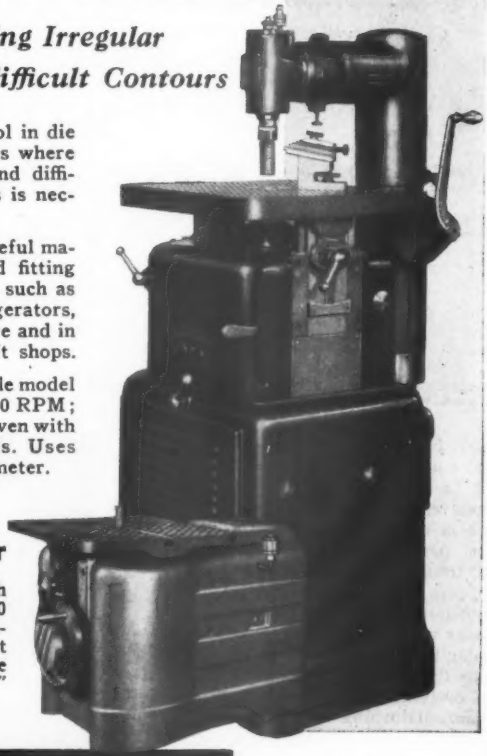
BARTH STAMPING & MACHINE WORKS Inc.

12650 Brookpark Road, Cleveland 29, Ohio

Boyar-Schultz

No. 2 PROFILE GRINDER

. . . for grinding Irregular Shapes and difficult Contours



A standard machine tool in die shops and in tool rooms where grinding odd shapes and difficult, irregular contours is necessary.

It is a particularly useful machine for grinding and fitting large dies and punches such as forming dies for refrigerators, table tops, sanitary ware and in automotive and aircraft shops.

Spindles in dual spindle model illustrated, turn at 10,000 RPM; stock removal is rapid even with small diameter wheels. Uses wheels ¼" to 3" in diameter.

No. 1 Profile Grinder

A bench model with spindle speed of 20,000 RPM. Performs in minutes, many jobs that would ordinarily require hours. Uses wheels ⅛" to 1" diameter.

BOYAR-SCHULTZ Corporation

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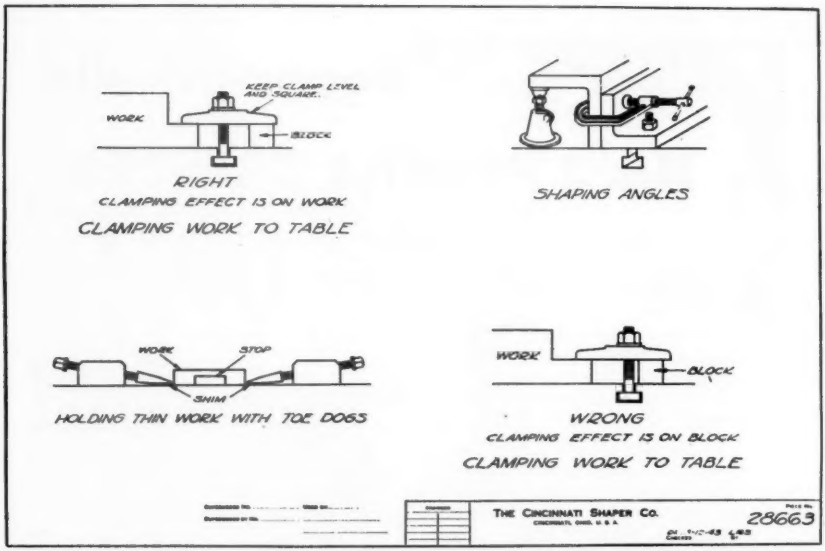
WRITE FOR LITERATURE FULLY DESCRIBING THESE TIME SAVING MACHINE TOOLS

. . . Shapers, from page 96



Drawing courtesy Cincinnati Shaper Co.

The right and wrong way to clamp work to the shaper table, clamping to shape angles, and holding thin work with toe dogs are illustrated.

shaper jacks, clamps and other conventional equipment may be used for holding work to the shaper table, there are also various cases in which a good magnetic chuck is well worth consideration. Sometimes permanent magnetic chucks are used to advantage in cases where only light cuts are involved.

Grinders can be and are applied to shapers to advantage in various cases. A grinder may be used in a shaper for finishing the same piece of work which has been preliminarily shaped in the machine without disturbing the work piece. This definitely has its production value in many instances. Certain horizontal feed center grinders are used on shapers, as well as on other types of metal working machines. Some manufacturers of portable grinders have machines which may be used on the shaper when desired.

Portable Shaper Handled by Crane

Metal working shapers are more versatile than many mechanics suppose. In

(Continued on page 190)

Photo courtesy Cincinnati Shaper Co.

Many machining operations can be performed on the shaper when adequate work-holding accessories are available. The shaper vise is one of these holders. The illustration shows a vise mounted on a shaper bed with a work piece set up for machining.

good judgment calls for

PARKER-KALON®

when good design calls for

SOCKET SCREWS

P-K SOCKET SCREW BULLETIN

16 pages, describes all types, lists sizes, and illustrates quality control back of P-K guarantee. Free on request from your local P-K Distributor. Ask for samples. See why P-K Socket Screws take top honors in any test. Parker-Kalon Corporation, 200 Varick St., New York 14.

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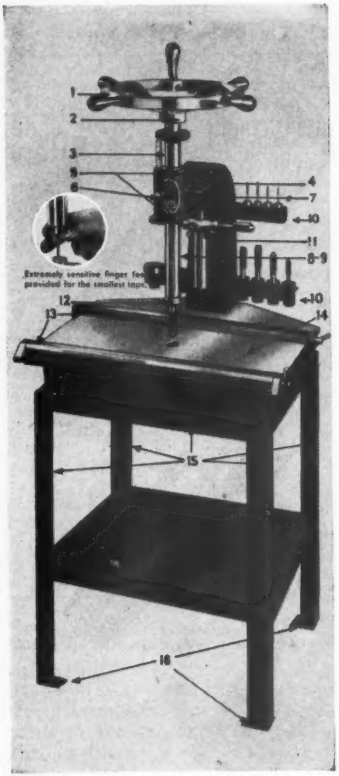
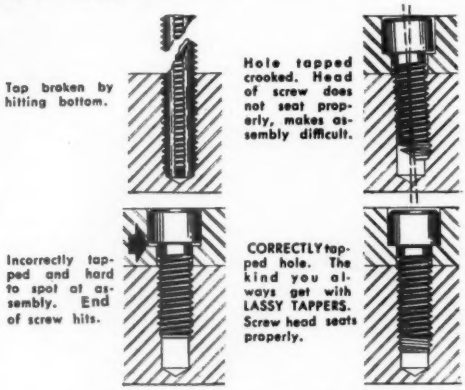


LASSY

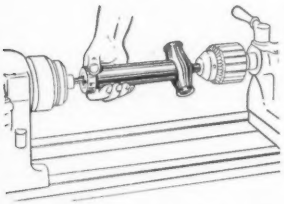
MODEL 12-F HAND TAPPER

is the finest hand tapping machine made. Has LASSY direct-reading DEPTH GAUGE. Shows exactly how deep tap is in the work, prevents broken taps. In use in hundreds of shops, universities, experimental rooms and governmental agencies. GOOD FITS, RIGHT ANGLE HOLES tapped to correct depth, with no tap breakage, are easily achieved while using unskilled labor.

THE LASSY DEPTH GAUGE consists of an instantly adjusted gauge ring on the spindle and a scale beside the main bearing. Eliminates guess work. Speeds up tapping and prevents broken taps by showing exact depth tap is in work. Also speeds up assembly operations by having holes tapped to correct depth.


Tap broken by hitting bottom.
Hole tapped crooked. Head of screw does not seat properly, makes assembly difficult.
Incorrectly tapped and hard to spot at assembly. End of screw hits.
CORRECTLY tapped hole. The kind you always get with LASSY TAPPERS. Screw head seats properly.

LASSY Universal Tap & Die Guide
See No. 11



Assures good fits and good threads as the tool is always in line. It can be used with power or by hand. This versatile tool is ideal for all lathe tapping and threading. Guide sliding on pin allows taps and dies to follow correct lead.

MODEL 12-F Tap capacity ⅛" to 1"

Complete with Holding Bars, Depth Gauge & 12 Tap Adapters ⅜5 to ⅝"	$177.00
2 Tap Adapters 11/16" & ¾"	9.50
6" Universal Tap & Die Guide	18.75
4 Die Adapters ⅝" to 1½"	19.00
Complete Unit Price	$224.00

Taps not furnished F. O. B. Plainville

Write for bulletin describing 16 outstanding construction features of Lassy Tappers.

LASSY TOOL CO., 96 Bohemia St., Plainville, Conn.

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How a carbide die outperforms a steel die by 25 to 1 for Schick, Inc.

In past six years, a Carboloy die (shown at left) produced over 62,500,000 parts with only 25 regrinds. It saved 4,375 hours of steel-die regrinding time . saved 900 hours of press setup time because of longer production runs. Carbide die produces over 2,500,000 pieces per grind . . steel die, less than 100,000.

Carboloy Cemented Carbide die built for Schick, Inc., in 1946 by Lincoln Park Industries under direction of Mr George F Eglinton. Die is still in daily use.

You get more carbide benefits with Carboloy dies and services!

For blanking, forming, drawing and piercing dies that will stand up under terrific hour-after-hour pounding . . . always specify Carboloy Cemented Carbide.

It's quality-controlled by 29 rigid, probing tests that stem from Carboloy experience as world's largest maker of cemented carbides.

You get extra die life from Carboloy Cemented Carbide — hardest metal made by man — because extra life is built into it!

Carbide benefits

You or your die maker may order Carboloy Cemented Carbide made to your specifications in rough-finished form. You get all carbide benefits . . . and final finishing and assembly into your dies are easily done in your own toolroom, or by your die maker

Carbide specialists

Carboloy Field Engineers are ready with on-your-job solutions to tough die problems . . . and ready to help you design new carbide applications.

Carbide training

Your key toolroom personnel can learn latest carbide techniques, become expert in finishing and servicing carbide dies at the Carboloy Customer Training School.

Carbide data

For a handy, all-inclusive guide showing how easy it is to design, use and maintain carbide dies, write for the Carboloy Die Engineering Manual, D-124.

To get the complete story of how Carboloy dies and engineering services offer more carbide benefits . . . greater production with less downtime and maintenance . . fewer rejects and less refinishing . . . call in your local Carboloy representative or use the handy coupon below

"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company

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DEPARTMENT OF GENERAL ELECTRIC COMPANY

11111 East 8 Mile Street, Detroit 32, Michigan

Plants at Detroit, Michigan; Edmore, Michigan, and Schenectady, New York

Magnet ideas for the shop!

Use Carboloy Permanent Magnet Sheet-Steel Separators to prevent feeding of doubles. And use permanent magnets to give an extra hand all around your shop. They're great for magnetic stands, tool-holding devices, sweepers' pickup tools, magnetic paper grippers, containers for small parts and magnetic retrievers. Write for Carboloy Permanent Magnet Stock Catalog, PM-100. (Use coupon.)

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We are interested in the Carboloy services checked below:

☐ Die Training School ☐ Die Engineering Manual, D-124 ☐ Permanent Magnet Stock Catalog, PM-100 ☐ Have a Carboloy Field Engineer call.

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Company _____

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. . . from page 80, The NEW, January 1953

TOOLING and PRODUCTION

You will benefit also* in your perusal of the new *TOOLING and PRODUCTION* advertising pages. The larger areas, be they two-page spreads or one-eighth pages, will enable our advertisers to do greater justice to their products. And by the same token, their larger illustrations, less crowded technical copy, data and specifications, and more effective use of color and layout will all make it easier for you to study their wares.

*See page 80.

The demonstrations below will give you an idea of what's to come.

Built-Up Edge

The noticeable improvement in the surface finish when machining at high speeds, where carbides are most efficient, is due to a great extent to the gradual elimination of the socalled built-up edge. Figure 16 shows the

Fig. 1. The above lines show how we have been "saying it" on our major editorial pages, with an 8-point type face set on 9-point measure, and a column width of 14½ picas. Shown below is the typography we have been using in our reader service departments: *Publication Previews, Progress on Parade,* and *Shop Aids;* a different 8-point type face, and "set solid". And, you are reading the caption type face we have been using with our illustrations.

CARBORUNDUM PRESENTS this very useful handbook, pocket size for shop convenience, on Safe Rules and Methods for Disc Grinding. Engineering drawings and tabular and typographical description clearly describe the following points:

Built-Up Edge

The noticeable improvement in the surfa
finish when machining at high speeds, whe
carbides are most efficient, is due to a gre
extent to the gradual elimination of the s
called built-up edge. Figure 16 shows the

**Fig. 2. Here is the new setup, come January 19
Above, are the same words set in a 10-point type face
a 12-point measure. The new column width is 18
picas. Below, in duplicate for comparison, is the n
treatment for our departmental items: a 10-point ty
face set on 10-point measure. The departmental pa
will be of two or three columns depending upon locati
And this that you are now reading is the new style ty
for our picture captions.**

CARBORUNDUM PRESENTS

This very useful handbook, pocket size for sho
convenience, on Safe Rules and Methods f
Disc Grinding. Engineering drawings and tab
lar and typographical description clearly d
scribe the following points:

It is our hope that you will derive as much pleasure in receiving and using the new *TOOLING and PRODUCTION* as we have in "retooling" it! We trust you will let us know how you like it. Your frank comments, suggestions or criticisms will be equally welcome.

Sincerely,

E. Willard Pennington

editor

New Precision and Efficiency For HEAVY-DUTY Work!

CLAUSING

12" HEAVY-DUTY LATHE

TIMKEN BEARING EQUIPPED

WITH A.S.A. L-00 TAPERED KEY DRIVE SPINDLE, 1" COLLET CAPACITY, 1⅜" BORE

You'll find this Clausing lathe as outstanding on 24-hour production as in the tool room or research department.

This partial list of features explains why—the spindle is forged steel—turns on *Timken tapered roller bearings;* ground semi-steel alignment; headstock, gear box, and apron gears are *oil-bath lubricated; automatic apron is one-piece, double-walled;* there's quick-change selection of 48 threads or feeds; choice of 8 speed countershaft or Variable Speed drive—24", 36", or 48" between centers.

There is no comparable lathe at Clausing's price in the 12" field. Ask your Atlas dealer to show it to you, or send for latest catalog.

Atlas CLAUSING PRECISION MACHINE TOOLS ATLAS PRESS COMPANY

CLAUSING DIVISION
ATLAS PRESS COMPANY
12115 N. PITCHER ST. • KALAMAZOO, MICH.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

New Process Materials Give Outstanding Results on Hard-to-Machine Metals

A relatively new family of materials that improve the machinability of difficult-to-machine metals, has found cautions but enthusiastic reception in trials being run on both toolroom and production work at the A. W. Hecker Company plant in Cleveland. Increased tool life is the most promising benefit obtained so far, although in many instances an improvement in surface finish, less machine exertion, and higher rates of metal removal have also resulted.

Fig. 1. Shaper operating "dry".

These fluid materials known as Metalloid and Tapeze are formulated in a number of different viscosities and chemical compositions, suitable to application by flood, spray, or brush and for various operations and operating conditions. Unlike most cutting fluids, they do not cool the work and tool by heat transfer, but tend to reduce the amount of heat generated by chemically increasing the internal energy in the material. This permits work rupture or cleavage without excessive plastic flow or deformation.

Basically, Metalloid is a solublized organic condensate containing chlorine, nitrogen, oxygen, and carbon in a complex molecule. Unlike carbon tetrachloride which functions in a similar manner, it is non-toxic and is also non-irritating to the skin. With little exception, it is non-corrosive and non-staining; and, in fact, it leaves a protective film which can be easily removed at any time. Metalloid may be used "as is", or diluted in paraffin, napthenic oil, or certain other commonly used fluids depending upon the particular application.

The principal objective presently being sought at Hecker's is to determine the range of application for each fluid and the best method of dispensing it, and to acquaint toolmakers and machinists with these materials.

A good example of results obtained on trial runs is the preliminary squaring and sizing of large high-carbon steel forgings (SAE-1045) on a conventional shaper with high-speed-steel tool bit. Running dry, a 5/16" depth of cut was taken at .010" feed, and tool traveling at 19 strokes per minute, with a 24" stroke. This was a real hogging cut for this machine running dry. Chips (Fig. 1.) were formed irregularly, most being loosely coiled and turning back onto the machined surface, with some chips welding to the tool and being carried

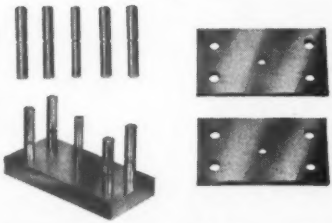
(Continued on page 110)

Fig. 2. Shaper operating with Metalloid.

4 Hole Grinding Problems { CAN YOU ESTIMATE THE TIME?

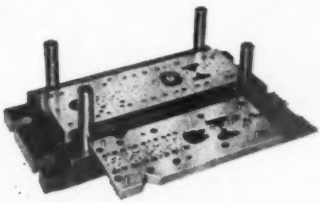
TWO-STATION DIE BLOCK

All holes ground to exact size and location. Blank hole and center piercing hole ground with one half degree included taper. Little clearance permissible between punch and die. 2¾ *hrs. on the Moore Jig Grinder.*



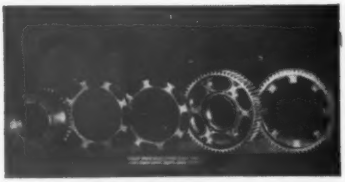
TEN HOLES IN MASTER PLATES

Hardening distortion corrected in two plates. Ground to size and location *independently* and to plug gage fit in any of the four possible positions. 3½ *hrs. on the Moore Jig Grinder.*



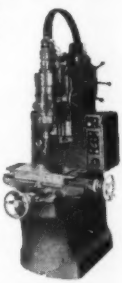
TEN-STATION DIE

100 holes located and ground to .0002" tolerance in hardened die and stripper inserts. Die parts, four stripper inserts, two cutting punches and shaving punch ground in 50 *hrs. on the Moore Jig Grinder*



FIVE ACCESSORY GEARS IN MASS-PRODUCTION

Gear A: Eight holes on circle ground to size and location within ±.0003"...*Gears B, C, D, E:* Radii at ends of elongated pockets ground to size and location within ±.0009"...*Gears B, C:* Radii ground to shoulder near bottom of pocket within ±.0005". *With special indexing fixture, 4 aircraft engine gears per hour finished on the Moore Jig Grinder*

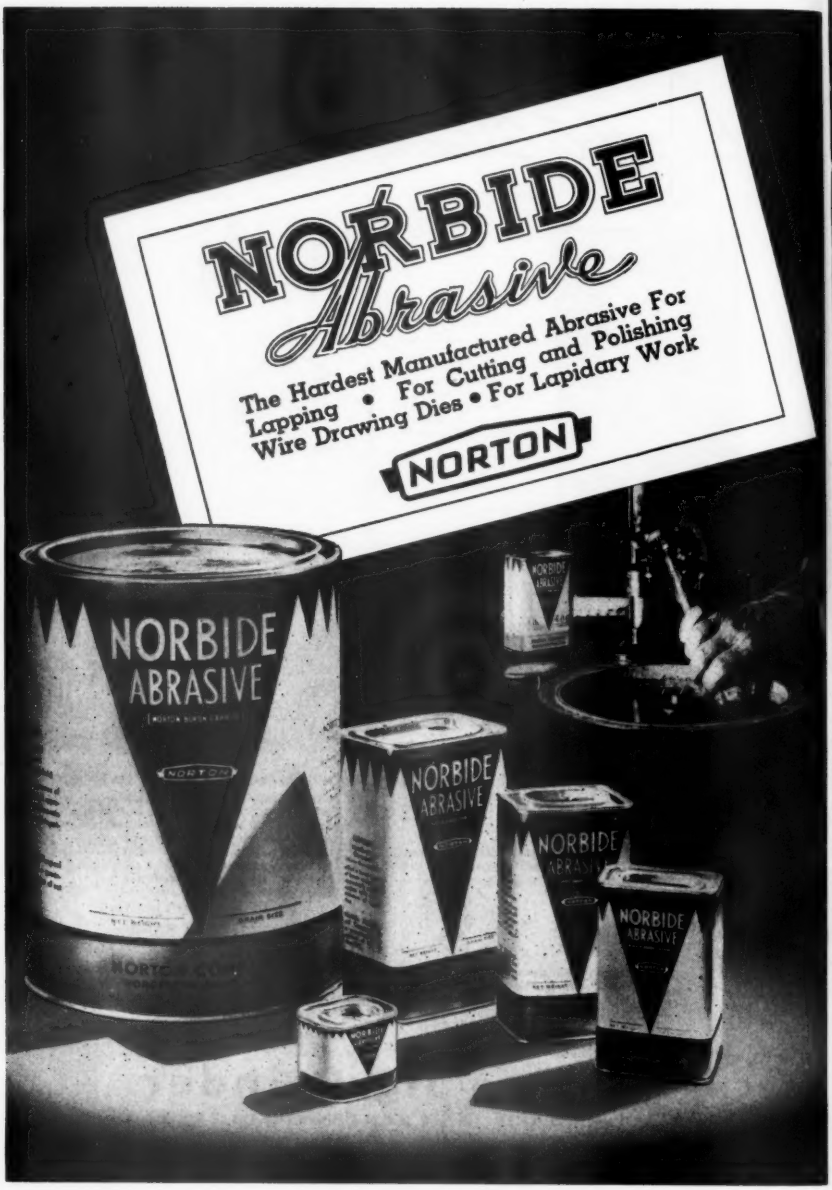


"Correcting Hole Location Within Less Than .0001" is the title of our new 28-page catalog which describes the operation and applications of the Moore Jig Grinder to dies, drill jigs, gage parts, master plates and production parts. Write for your copy today.
MOORE SPECIAL TOOL CO., INC. • 726 UNION AVENUE, BRIDGEPORT 7, CONN.

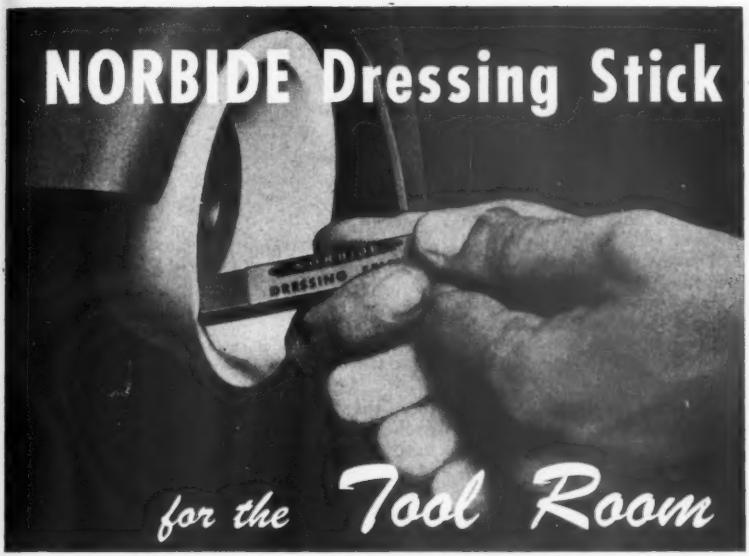
MOORE TOOLS

Moore Jig Grinder
THE ONLY MACHINE OF ITS KIND

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS



FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD



The increasing demand for NORBIDE sticks arises from the successful experience with them in many tool rooms over a period of years. These, the hardest dressing sticks ever made, have demonstrated their ability to bring economies by giving extremely long service life. Because of their great hardness and wear-resistance, many NORBIDE dressing sticks are still in service after more than two years of continuous service.

NORBIDE sticks dress tool wheels quickly and efficiently. They are perfect for tool wheels 10" and smaller, especially cup and saucer shapes—although they are also successfully used on straight wheels.

NORTON

NORTON COMPANY
Worcester 6, Massachusetts

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

. . . Processing Material, from page 106

back on the return stroke causing excessive clapper action. Tool life was short, usually not sufficient to work the block across its full width.

A simple brush application of Metalloid on the work surface and the cutting tool produced amazing results. Whereas the machine could previously be seen and felt to be laboring in the cut, now the tool moved back and forth as if it were cutting cheese. There was no perceptible vibration in the machine. The chip formed into a spiral (Fig. 2) that rolled smoothly ahead of the tool and away from the machined surface. There was no welding of chip to tool, and no chips were carried back on the return stroke. The machined surface was appreciably smoother. When the speed was increased to 27 strokes per minute, results were still good although the machine was again laboring. The operator was inclined to think that use of a drip-can, assuring constant fluid at the tool point under the chip would fully restore the initial benefits.

The difference in chips produced can be seen more clearly in Figure 3. Those at the left were formed when using the fluid and those at the right were produced by the machine running dry.

The Hecker organization does considerable work on production machining of stainless steel and similar materials for aircraft parts and food machinery. In one case, Hastelloy "C" was being face milled to ⅛" depth on a ⅝2 B & S, using a high-speed-steel shell end mill of 4" dia. Trouble was being experienced with tool corners breaking off. This condition plus normal wear meant that the cutter seldom lasted for more than one workpiece. A Tapeze dilution has permitted an increase in speed from 30 rpm to 40 and even 50 rpm, while retaining the same feed. Corner chipping is practically eliminated, and cutters now last for 15 to 20 pieces between grinds. The work finish is substantially improved.

In this work, also, much hand tapping is necessary. Using conventional fluid, considerable force was previously required to tap Hastelloy, with the tap breaking off in the hole on many occasions. On one particular job, taps seldom lasted more than four holes. Tapeze is now used exclusively for the hand tapping of these hard materials. Little effort is required of the operator, and the taps are lasting to the extent that none have been replaced to date.

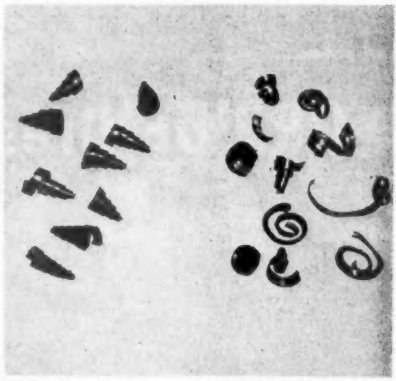
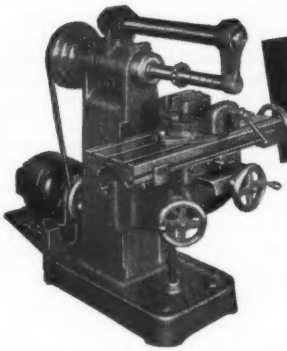


Fig. 3. Comparison of chips produced by shaper using Metalloid, left, and without any fluid, right.

For precision boring in Hastelly "B", using carbide tools on a jig borer, the introduction of Tapeze increased productivity approximately 100%, with the additional benefit of completely eliminating the bell-mouth condition formerly experienced.

In using high-speed-steel thread chasers on Hastelloy, one job involved a thread 0.005" deep and required three passes to achieve the necessary depth and finish. Tapeze permitted cutting the same thread in just one pass, with much better tool life as an added benefit.

These results, in the opinion of A. W. Hecker Co. engineers, are not wholly conclusive. Nevertheless, those successes experienced during preliminary tests have been so encouraging that every machinist in the toolroom, for example, has asked for and now has a supply of Tapeze that he is using on his more difficult jobs. Accumulated experience is expected to demonstrate an optimum combination of speed, feed, depth of cut, choice of fluid, and tool material for any given job classification that will produce appreciably better results than previously enjoyed.



BENCHMASTER pays off 5 ways!

Where else can you find a *low cost* tool with so many cost-cutting possibilities?

1 FOR HORIZONTAL MILLING quill and overarm slip quickly and snugly in place. Timken Tapered Roller Bearings provide a rigid spindle support at high speeds as well as low. No. 2 Morse Taper. 12½" horizontal table travel with a big 6" x 18" table area.

2 WANT A VERTICAL MILLER?

The same machine is quickly converted by substituting this special head. Again Timken Tapered Roller Bearings give smooth, chatter-free performance over a wide speed range. Accessories available: Full line of Benchmaster collets and drawbar; swivel-base vise.

3 WHEN IS A MILL NOT A MILL?

Here's a handy kink to obtain extra *lathe* facilities for facing, turning, forming, etc. Benchmaster Accessories required: Tapered Adapter and Tool Block. By lowering knee position and raising tool you can swing up to 23". Exceptional capacity!

4 QUICK CHANGE ARTIST

Here's the Benchmaster converted to a grinder! Free-rolling bearings maintain high spindle speeds without overheating or risking bearing injury. Grinds internally, surfaces, sharpens cutters, etc. Note Benchmaster 6" Rotary Table—a fine accessory.

5 AND NOW IT'S A DRILL PRESS

The No. 2 Morse Taper in spindle accepts standard Jacobs Chuck Shank. Raising table feeds work into drill. With this setup, drilling layouts is easy—simply measure off correct hole spacing with the lead screws.

NOTE: BENCHMASTERS are also available with rack and pinion feed. For production work this provides exceptionally fast operation.

BENCHMASTERS are accurately built with all the care and precision of larger, more expensive tools . . . yet may be purchased for a fraction of big machine cost! Get our circulars on all BENCHMASTER EQUIPMENT!

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★ For Quality
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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

Mechanized Movement at Monarch Speeds Lathe Production

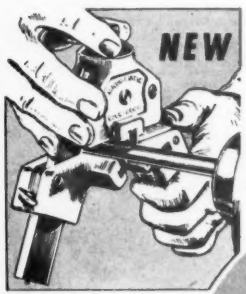
Materials handling is one of the key focal points of a thorough-going expansion and modernization program just completed by the Monarch Machine Tool Company, Sidney, Ohio.

The project, which called for the addition to existing plant facilities of 53,000 sq. ft. in new manufacturing and storage areas, also embraced a revitalization of materials-handling functions, an integration of equipment and methods for higher efficiency in existing areas, and their coordination with newly purchased equipment installed throughout both old and new production areas. Expanded single-floor production area of the plant now totals 308,000 square feet. In this area 80 over-head, gantry, and tramrail cranes are brand new.

Realizing the faults in work routing methods in general and in materials handling procedures in particular, Monarch has spent considerable time in completely revising its machine shop layout. Where formerly partially-worked materials had to be shunted back and forth between machining departments they are now moved progressively from one department to another. In the new plan, machines have been taken to the work, instead of the work being taken to the machines.

To implement this change, machine tools that had previously been grouped by type and function, have been relocated throughout the manufacturing area and augmented by new machines. Production of a lathe is no longer thought of in terms of one manufacturing procedure. Instead, many separate manufacturing departments have been set up; each with responsibility for machining and inspecting a single major component (such as headstocks, tailstocks, aprons, carriages, and beds). As many machine tools as are required for each of the individual manufacturing units have been assigned to that unit, and its floor area proportioned accordingly.

As the new departmental idea took form, it was apparent that new ideas of production could also be incorporated. The result has been the installation of basically straight-line production methods. Raw materials—castings, forgings and bar stock—enter the building from the south, progress through


NEW
Odee-HONE
A Single Tool for Honing any CYLINDRICAL SURFACE
from ½" to 2½"
in diameter—any length
Simple to set up and operate
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Removes stock—Holds accurate size—Generates round, straight surfaces—Develops any degree of surface finish without chatter. Use with any lathe, drill press or electric drill.
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the various production departments and emerge from the north end of the plant as finished lathes. The individually manufactured components, and the lesser parts and accessories come together in the erection area at the north end of the building where they are assembled, inspected and tested as complete machines.

Basic to this straight-line flow of materials is a 930-ft. middle aisle that stretches from one end of the manufacturing area to the other. Overhead cranes serve this 53-ft. wide manufacturing bay from one end of the building to the other. Also available for use with these overhead cranes are many smaller gantry cranes. In many instances there is not one but several choices of equipment for any given lift. This reduces waiting time and insures uninterrupted production.

Steady production is one of the greatest benefits accruing to the new layout. Little space is taken up with parts storage between operations. No more than enough extra parts are in progress at any one time to keep operations moving without interruption. Also, since materials flowing through the main production and individual manufacturing areas are always headed in the same direction, much waste motion and lost time have been avoided.

The materials handling equipment is overlapped in such a way that it is completely integrated with the production process. For example, wherever a lifting job must be done, whether inside or outside the plant, there is always at least one mechanical aid at hand to assist.

Castings are trucked to the plant from various foundries. A small car crane unloads the medium and small size castings and they are stacked in the casting storage yard at the south end of the plant. Beds and other large castings are unloaded from the trucks by an outside, tram-rail crane; then stored within the crane rail support columns. Castings are loaded on four-wheel buggies or platforms by the outside cranes and towed into the plant by tractor as needed.

Small and medium-sized castings are delivered to a large shot blasting machine just inside the plant where they are completely cleaned prior to protective painting. Hand grinders are used to remove irregularities. The bed frames are unloaded onto double, tracked dollies by one of the overhead cranes in the main bay. Because they must accommodate several

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can be bored with precision

Bokum Boring Tools will produce perfectly aligned holes — any diameter down to 1/16"— giving you uniformly smooth bore to extreme depth.

Outstanding features: long life; constant clearance throughout repeated sharpenings; resharpening done on one face only.

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different sizes of beds, these dollies are not inter-connected. Beds remain on them during all hand cleaning and painting steps.

Two water-bath paint spray booths are used; one for small and the other for medium sized castings. Small castings are moved by hand on metal grates that travel on fixed-roller conveyors. There are four conveyor lines, one of which passes through a paint spray booth.

Across both ends of all four conveyor lines run floor level tracks that support and guide roller transfer tables. These are slightly larger than the grates on which parts are carried so as to facilitate transferring grated loads from line to line. The spray line conveyor is broken by a 360-degree turntable in the middle of the booth. Medium sized castings are handled at the other booth by "mules" or overhead cranes.

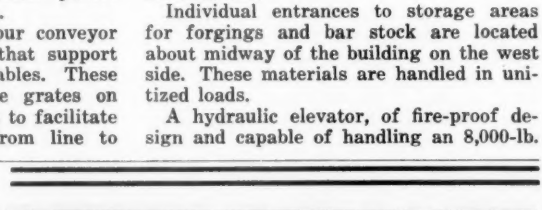
From the painting stage on, the handling of the parts is entirely determined by their size and the quantities in which they are required. They are handled individually, are loaded into tote boxes, or stacked on platforms. Large, individual parts can be moved by any of the numerous cranes throughout the production area. The tote box or platform loads can be transported by platform truck, fork lift truck, hand "mule" or, in some instances, tracked dollies.

Cranes are used for many operations besides transporting materials. At any point during the production process where large parts must be handled, they are lifted by crane. Cranes are used to position large parts on the machine tools, to help during the fitting of parts and to facilitate final assembly operations on the erection floor.

To move large, finished lathes from east to west across the erection area, one or more floor tracked dollies are used. Placed on these dollies a lathe can be readily transferred to the west side of the plant where a west cross-traveling crane can make a lift. From this point the load is handled progressively through finish painting, crating and loading on truck or railroad car.

Individual entrances to storage areas for forgings and bar stock are located about midway of the building on the west side. These materials are handled in unitized loads.

A hydraulic elevator, of fire-proof design and capable of handling an 8,000-lb.



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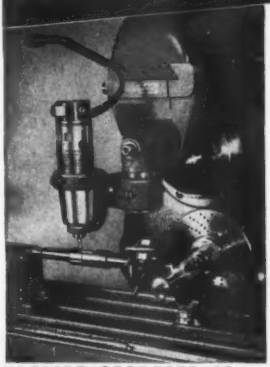
FOR TOOL ROOM AND PRODUCTION



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Little can be done today to reduce labor and material costs. For substantial savings employ new, better techniques. Mount PRECISE Grinder-Millers on lathes, drill presses, milling machines and other machine tools or use in special production set-ups. ¼ HP; speeds from 20,000 to 45,000 r.p.m.; 115 volts, AC-DC. Ruggedly built for continuous duty. All metal housing; rigid PRECISE quill; sealed micro-precision bearings. *High speeds and accurate PRECISE quill and chuck are ideal for tungsten carbide cutters.* PRECISE will grind, mill or finish any material from soft wood to the hardest alloy steel.

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PRECISE PRODUCTS CO., 1341 Clark St., Racine, Wis.

PRECISE GRINDER-MILLERS

load, connects the parts stockroom floor basement with the manufacturing floor above. It is conveniently located near a truck receiving dock at the northeast end of the plant to take care of incoming shipments of small parts and supplies.

Jig and fixture racks, together with general storage racks, are located at various other points on the manufacturing floor where they are readily served by fork lift and platform lift trucks.

Lumber for crates is delivered by truck or rail to the lumber stores space in the shipping department. Crates are constructed on tandem, unconnected dollies that can accommodate any length of container. As a crate is completed, it is rolled toward the finish paint position, handled from then by shipping area crane.

Waste metal is an important item around a metal-working plant. At Monarch it is carefully retrieved, mechanically hammered into small pieces, briquetted and delivered to a truck by a crane-supported electro-magnet. Crane rails for this operation extend outside the plant and over the west delivery area.

The new departmentalization system, new materials handling facilities, in effect a short time, confirmed benefits expected from their adoption.

INDUSTRY NEWS

Of interest to industry in Southern Ohio and adjoining states, is the announcement of the newly formed corporation, The Die Supply Sales Co., taking over the sales and service responsibilities of the Die Supply Co., formerly at 915 Valley St., Dayton, Ohio and moving into its recently completed building, 311 Vermont St.

The new company continues under the direction Mgr. and George T. Russel, Office Mgr.

Peninsular Appointment

The appointment of Dr. Samuel S. Kistler internationally known chemical engineer and authority on abrasives, as research associate of the Peninsular Grinding Company of Detroit was recently announced. Dr. Kistler had previously resigned from the position of director of research for the Norton Company, to accept the deanship of the University of Utah college of engineering. His decision to join the Peninsular organization is a high tribute to its activities. Dr. Kistler's many years of resarch in the abrasive industry have proved invaluable in the development of new methods of manufacturing in both resinoid and vitrified fields. Since graduating from Stanford in 1921, his time was been divided between teaching and applied research.

If you buy Cutting Tools

HERE'S HELP FOR YOU!

TOOL BITS • END MILLS • MILLING CUTTERS • CUT-OFF BLADES • ALLOY CENTERS • SLITTING SAWS • INSERTED BLADE CUTTERS • WEAR PARTS • HIGH SPEED, CAST ALLOY, CARBIDE "SPECIALS" • ROLLS • ROTARY SHEARS

Do you buy or specify cutting tools and wear-resistant parts? You'll find this Gorham Tool Catalog a *helpful time saver!* Its 120 pages are packed with useful cutting tool information . . . plus a valuable section of Engineering Data. Request your free copy on company letterhead. In *special* tooling problems, consult your nearby Gorham field engineer. His counsel is yours for the asking, and it's backed by Gorham's 35 years' experience in the design and production of fine cutting tools. Write for his name.

Gorham TOOL COMPANY
"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"
14415 WOODROW WILSON • DETROIT 3, MICHIGAN
WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne 4, Calif.

. . . Grinding Wheel, from page 92

flanges becomes .056 x $\frac{20.9975}{3}$ = .4 oz.

This amount of unbalance is small and is negligible in most types of grinding where wheels are used on sturdily built machines.

The method of testing for balance is illustrated in Figure 3. A 42" x 1.720" x 12" wheel is shown mounted on an accurate spider integral with an arbor which can freely rotate on parallel, horizontal ways. The wheel is permitted to rotate until it comes to rest with the light spot at the top. The operator then selects a weight which, when attached to the wheel periphery, will cause the wheel to be in standing balance when rotated to any position. Note the small spring weight attached to the wheel periphery 90° from the top position. This is the weight required to place this 185-pound wheel in suitable balance condition.

Our conclusions are that when a wheel is mounted eccentrically as a result of usual manufacturing and very necessary oversize in the hole, the resultant unbalance is of small magnitude. After rough truing such a wheel on the periphery, the amount of unbalance becomes about one-tenth as much and is in the opposite direction. Obviously this amount of unbalance is insignificant in most grinding operations.

It's Time for Christmas Lights

A 20-page booklet with 63 ideas for large scale Christmas lighting schemes has been developed by Westinghouse Electric Corporation.

These 63 designs, which are presented through line drawings in the new booklet, show how store fronts, streets, schools, and community houses can be decorated for Christmas. Lighted wreaths, silhouettes, stars, and large candles are effectively utilized in the designs. A section of the booklet tells how to make the various components.

A similar but smaller booklet for home owners is also available. This 11-page booklet gives picture examples of outdoor and indoor displays, describes each, and tells the reader how to construct them.

Both booklets include descriptions of the lamps necessary to affect displays.

Copies of these Christmas lighting booklets may be obtained through utility companies and Westinghouse Lamp Division sales offices.

Gaillard Seminar

Dr. John Gaillard, mechanical engineer on the staff of the American Standards Association and lecturer at Columbia University, will hold his next five-day private seminar on industrial standardization from January 26 through 30, 1953, in the Engineering Societies Building, 29 West 39 Street, New York City.

The Gaillard Seminars were started in 1947 upon request from companies for assistance in the organization of their standardization work and the training of their men in writing standard specifications. The total attendance so far has been 158 representatives from 98 organizations. The average seminar group has consisted of 14 men.

The January, 1953, session will consist of ten conferences, one in the morning (9:30 to 12:00) and one in the afternoon (1:30 to 4:00), Monday through Friday. At each conference a subject on the seminar program will be presented by Dr. Gaillard and then discussed around the table.

For further details and registration write Dr. John Gaillard, 400 West 118 Street, New York 27, N. Y., or phone him at the ASA office, MUrray Hill 3-3058.

Rahn Granite Surface Plate Company has added a new wing to their plant at Dayton, Ohio. The Research Laboratory and Offices have been moved into the new structure, vacating space now being used for an enlarged stock of finished surface plates.

The new, improved Research Laboratory provides for accelerated development work on granite surface plates and other basic precision inspection equipment in granite.

Talk of Recession = Hebetudinous Nonsense

Ten greatest fields of opportunity for America after the defense program passes its peak are nominated in the November issue of the York Report, a newsletter circulated among top corporation executives by the York Engineering & Construction Co., and the York-Gillespie Manufacturing Co., of Pittsburgh.

The ten, selected "not so much for profit as for advancing civilization and culture in America and the world", are:

1. Fuel from atomic energy.
2. Electronic brains.
3. Push-button factories.
4. The engineered home.
5. Television advances.
6. The small car.
7. New metal processes.
8. Advances in rare earths.
9. Antibiotics and farm chemicals.
10. Better plastics.

Anticipating that the selection will provoke considerable discussion and not a few dissents, the York Report states: "This is a guess — an educated guess for which we have drawn on the experience and imagination of our engineers and economists. There may be errors. But the greater chance of error lies, not in the possibility that any of these ten will fail, but that other developments, now unknown, will overtake them."

It adds, "Another list of ten best, without duplicating any but atomic energy on the list—might be defendable. But so many other ideas and inventions are bursting out of laboratories into production that any of them could have more potentials than any one of those cited here. We cannot even count our riches."

Among the runners-up, the York Report cites bigger and faster development of hydroelectric power, printed electronic circuits, the helicopter, guided missiles, synthetic oils, more materials from the sea, new test-tube fibers, newer silicone products, soft X-rays in food preservation, wireless transmission of electric power, ceramic fibers and new building aggregates. It concludes, "Hebetudinous nonsense is all this talk of recession after defense reaches a peak. Opportunities are so dazzling that it is little wonder some see only the shadows."

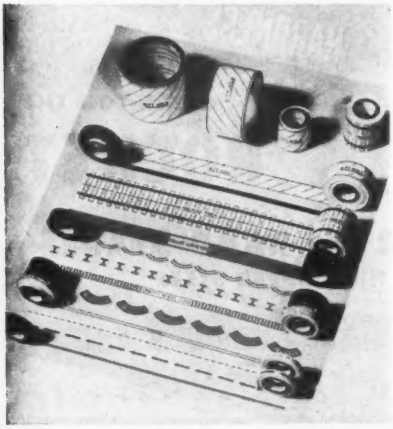
"If America is ending a cycle, it is only to enter another beyond calculation".

Pre-printed Adhesive Tape Eliminates Drafting of Repetitive Symbols

Plant layout planning departments of many large industrial plants are reporting large savings in costly drafting time by using pre-printed adhesive tape. The tape is printed with all the symbols applicable to plant layout.

This new tape has many advantages. Not only is the tedious initial drawing of repetitive symbols eliminated, but changes in temporary layouts can be made instantly by simply stripping the tape from its original position and placing wherever wanted. No re-drawing or erasing is ever necessary. Since the tape is "pressure sensitive" (sticks without moistening), it can be stripped off repeatedly without leaving a mark or losing its adhesive quality.

All standard symbols for walls, aisles, conveyors, monorails, center lines, columns, shafts, stairways, service lines, railroad tracks, sidings, colored arrows for material and process flow, etc. are available in either 324" or 648" rolls (or both), scale ¼" to 1 ft., in opaque or transparent types. The opaque types are used for photo-copying; the transparent for reproduction on standard ammonia vapor machines.



Photos courtesy Labelon Tape Company, Inc.

Fig. 1. An assortment of printed symbols showing aisles of different widths, railroad tracks, roller conveyor, gravity conveyor, overhead monorail, arrows and line markers.

Fig. 2. This illustration shows the printed tape being used in making a layout.

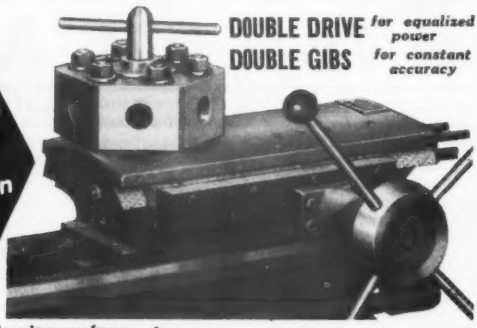
Tapes are acetate of high tensile strength and excellent printing quality, wound on heavy cardboard cores, wrapped in foil and packed in separate boxes. Adhesive and all other qualities are retained almost indefinitely whether stored as shipped or applied to layout sheets.

The manufacturer is planning additional symbols which will soon be available as well as a complete selection to scale ⅛" per foot.

A representative selection of 15 symbols and 20 different rolls may be obtained in kit form, including a specially designed cutting knife and detailed instructions. Users may also make their own selections from the complete list of 45 symbols, colors and types.

This handy new layout tape actually saves in two ways—first, by reducing the time needed for the preparation of new plant layout plans, and, second, because of its greater convenience, by encouraging re-layout of facilities for greater productive efficiency.

Enco
Self-Indexing
HEXTURRET
For Lower Production Costs and Speedier Output



DOUBLE DRIVE *for equalized power*
DOUBLE GIBS *for constant accuracy*

√ Custom built to fit all lathes from 9" to 18".
√ Smooth, sensitive control with Pilot wheel drive through twin gears and racks.
√ All bearing surfaces hand scraped.
√ All parts of indexing mechanism hardened, assuring accuracy.

Manufacturers of the most complete line of Lathe Turrets in the country.

Send for Catalog No. 50.A.

Close tolerance shoulder-screw job held to plus .002; minus .000.

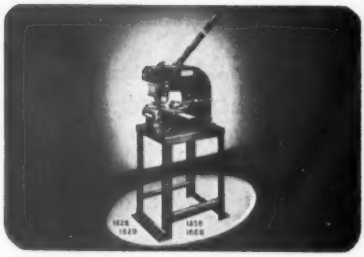
ENCO *Manufacturing Co., Dept.* 7102
4524 W. FULLERTON AVE., CHICAGO 39, ILL.

Reasonable Deliveries

WHITNEY - **JENSEN** PRODUCTS
41 YEARS EXPERIENCE

Nos. 1828 - 1829
Nos. 1858 - 1868

Deep Throat
LEVER PUNCHES



Powerful geared action develops tremendous punching power with little operator effort. Extremely versatile, suitable for a wide variety of work up to capacity. Deep throats facilitate working with large sheets.

Capactiy—½" thru 3/16" or 1-½" thru ⅛" mild steel—7-½ tons.

Throat Depths—7", 10", 18", 24"

WHITNEY · METAL TOOL COMPANY
724 FORBES STREET • ROCKFORD, ILLINOIS

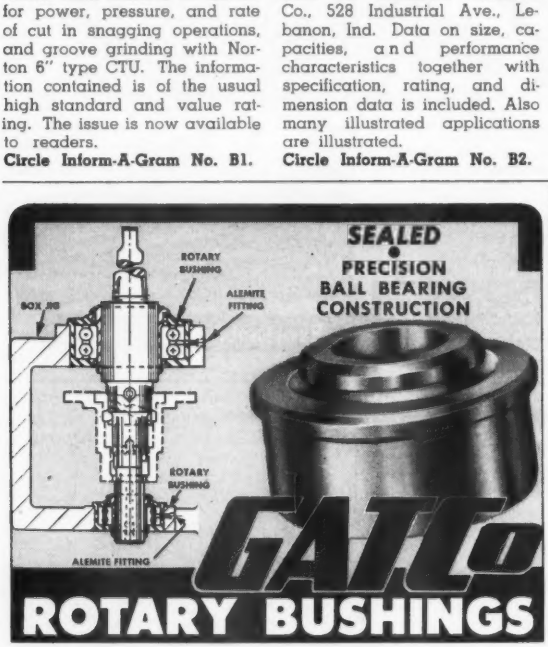
SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

PUBLICATION

Keep Informed! CATALOGS • BULLETINS • SPECIFICATIONS

Volume 3, No. 7, of "Grits and Grinds," from the Norton Co., Worcester 6, Mass., includes such features as advice for power, pressure, and rate of cut in snagging operations, and groove grinding with Norton 6" type CTU. The information contained is of the usual high standard and value rating. The issue is now available to readers.
Circle Inform-A-Gram No. B1.

Industrial Filters of endless belt and disposable types are described in a new catalog from the Industrial Filtration Co., 528 Industrial Ave., Lebanon, Ind. Data on size, capacities, and performance characteristics together with specification, rating, and dimension data is included. Also many illustrated applications are illustrated.
Circle Inform-A-Gram No. B2.



FOR DRILLING, CORE DRILLING, ROUGH AND FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

Eliminates expensive tool construction—Reduces tool wear—Prevents seizure and pilot breakage—Especially adapted where precision is required.

Write for full information and prices

GATCO ROTARY BUSHING CO.

42330 ANN ARBOR ROAD, U.S. 12, PLYMOUTH, MICH.
Telephone PLYMOUTH 1472

Cincinnati No. 10-66 Duplex Vertical Hydro-Broach is discussed in catalog No. M-1709-1 which is now available from the Cincinnati Milling Machine Co., Cincinnati 9, Ohio. Complete engineering specifications are given for this high production machine.
Circle Inform-A-Gram No. B3.

New Model BM-2055 Burr-Master for chamfering zerol bevel gears is described in bulletin No. 2055 now available from the Modern Industrial Engineering Company, 14230 Birwood, Detroit 4, Mich. Operating cycle and work mounting fixture plus construction details and specifications are fully described.
Circle Inform-A-Gram No. B4.

Radi-Form Grinder Attachment will move work in a predetermined arc of any desired radius, from 1/16" to 2" concave, from .00 to 2" convex. Radii within .0005" can be generated on carbide cutting tools on a standard unformed cupped diamond wheel. Literature and prices from W. F. Meyers Co., Inc., Bedford, Ind.
Circle Inform-A-Gram No. B5.

New 56 Page Catalog Covers Ace "Ground From The Solid" Drills. Complete line of standard drills is listed, also type "L" drills for plastic, 12" Longboy drills, drill blanks, centerless ground reamers, solid carbide drills and "Hi-Brinell" drills for hardened steel. Catalog also contains cutting fluid recommendations, drill pointing procedure, with suggested angles for various materials, table of cutting speeds and a consecutive listing of regular drill sizes. For your copy write Ace Drill Corporation, 2600 E. Maumee, Adrian, Michigan.
Circle Inform-A-Gram No. B6.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

Bulletin CM from Severance Tool Industries, Inc., has complete data, prices, and ordering information on the line of "Carbo-Mills," which come in a complete range for any purpose. These mills are ground from solid carbide, offer repeated regrind possibilities without efficiency loss.
Circle Inform-A-Gram No. B7.

Four Page Quick-Reference Bulletin on motors, regulators, and generators — bulletin A-2703 — from Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio, is designed to aid quick appraisal. Adjustable speed drive for AC circuits and electronic controls and regulators is featured. Interesting application data is included.
Circle Inform-A-Gram No. B8.

The Reich 3-Way Surface Test Indicator can be read by viewing from either side or at the end, has scale graduated in thousandths with a non-magnetic movement range of .014". Feeler may be set at any position from 90° of its vertical position. J. R. Reich Mfg. Co., 45 E. Stroop Rd., Dayton 9, Ohio.
Circle Inform-A-Gram No. B9.

New Starrett Air Hardening Flat Stock has been specially developed for punch and die use for long production runs or under extreme wear conditions. High non-deformation characteristics for maintenance of dimensional accuracy during heat-treating process. L. S. Starrett Co., Athol, Mass.
Circle Inform-A-Gram No. B10.

Ideal Electric Etchers are made in various models for different type and size of work. "Universal" model has four etch heats of 100 to 700 watts. Catalog data now available from Ideal Industries Inc.
Circle Inform-A-Gram No. B11.

Sessions Hyprecision Castings are described with design and engineering data in new booklet from the Sessions Foundry Co., Bristol, Conn. Tolerances of ± .005" per dimensional inch, smooth as-cast surface, draft angle requirement only half ordinary minimum, wear surface twice normal depth — these and other design details of the castings are discussed.
Circle Inform-A-Gram No. B12.

Chip-Tote Conveyor may be assembled from stocked parts to serve practically any automatic or multiple-spindle machine. Complete synchronization is possible. Complete elimination of machine downtime for periodic chip removal. Features described and illustrated in bulletin MF-640 from the May-Fran Engineering Inc., 1726 Clarkstone Rd., Cleveland 12, Ohio.
Circle Inform-A-Gram No. B13.

HARDNESS CONVERSION CHART

For Every Shop That Does Hardness Testing

This latest and most nearly accurate Hardness Conversion Chart is a necessity wherever hardness testing is done. It has been compiled and produced by CLARK, makers of the internationally respected CLARK Hardness Tester for "Rockwell Testing." Printed on heavy stock convenient for wall mounting, the chart is offered **free of charge** to hardness tester users. Just attach this ad to your letterhead or write "Send wall chart." A copy will be mailed to you without charge or obligation.

P.S. If you would also like information on CLARK Standard and Superficial Hardness Testers, we'll be glad to send that along too.

CLARK

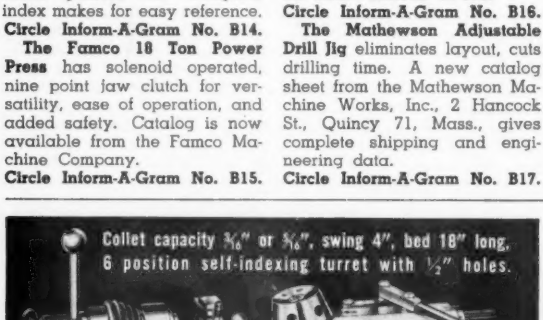
CLARK INSTRUMENT INC.
10208 Ford Road
Dearborn, Mich.
U.S.A.

"Everything For Safety" is title of new 144 page catalog now available from the Boyer-Campbell Co., 6540 St. Antoine Ave., Detroit 2, Mich. Included are face shields, welding helmets, compounds for skin protection, safety clothing, machine guards, etc. Complete index makes for easy reference.
Circle Inform-A-Gram No. B14.

The Famco 18 Ton Power Press has solenoid operated, nine point jaw clutch for versatility, ease of operation, and added safety. Catalog is now available from the Famco Machine Company.
Circle Inform-A-Gram No. B15.

American Pattern Files in a complete line for industrial use are described in a new folder from the DoALL Co., Des Plaines, Ill. Included are pitsaw, tapered, pillar and warding files. Complete ordering information is provided in tabular form. Bulletin 51-801.
Circle Inform-A-Gram No. B16.

The Mathewson Adjustable Drill Jig eliminates layout, cuts drilling time. A new catalog sheet from the Mathewson Machine Works, Inc., 2 Hancock St., Quincy 71, Mass., gives complete shipping and engineering data.
Circle Inform-A-Gram No. B17.


Collet capacity 3/16" or 5/16", swing 4", bed 18" long, 6 position self-indexing turret with 1/2" holes.
Immediate delivery of lathes and tools.

LEVIN® Jewelers type lathes for fine instrument work and second operations. Collets as small as .004". Send for catalog. Louis Levin & Son, Inc., 782 E. Pico Blvd., Los Angeles 21.

Engineering Services described in the 12 page brochure "The Milford Method" include fastener research to determine the exact requirements in individual cases; the development of designs for the fastener and dies to produce it; lab. sample testing; tooling of machines for setting of the fasteners and final checking in actual production for quality and strength. Complete information is given concerning the company's design, engineering and service facilities. The Milford Rivet & Machine Co., 900 Bridgeport Ave., Milford, Conn.
Circle Inform-A-Gram No. B18.

Acro-Bore Boring Unit replaces hand feed on boring heads, has a steady feed rate in any belt position. The feed rate of the unit is approximately 7/16" per minute, makes for fast accurate work with maintained tolerances and longer tool life between grinds. Skyline Tool & Gage Co., 4127 Newark Ave., Cleveland 9, Ohio.
Circle Inform-A-Gram No. B19.

New Cement Holds Drill Jig Bushings. Data sheets from Sheridan Products, 1054 E. Hyde Park Blvd., Inglewood 3, Calif., give technical information on this new product, specially developed for locating and retaining bushings without distortion and misalignment often encountered with press fittings.
Circle Inform-A-Gram No. B20.

Pocket Measuring Microscope has engraved scale for making linear measurements as small as .0005". This handy tool is about the size of a fountain pen has achromatic lenses fully corrected for color and spherical aberration. Some applications include measuring crest and root widths of threads, measuring radii, width of slots, chamfers, and grooves, and diameters of impressions in hardness tests. National Instrument Co., 5005 Queensbury Ave., Baltimore 15, Md.
Circle Inform-A-Gram No. B21.

New Prosser Carbide Grinder. Model AA, from Thomas Prosser & Son, 120 Wall Street, New York 5, N. Y., has improved features including full ½ hp motor and heavier shaft, giving greater reserve power, ruggedness, and freedom from vibration. Regular features include quick action indexing tables with rigid lock; compensation for wheel wear; and provision for use with diamond, silicon carbide, or aluminum oxide wheels. Models and sizes for wet or dry grinding, full range of attachments.
Circle Inform-A-Gram No. B22.

New Line of Large Capacity Gravity Feed Oilers are described in bulletin 61-11 by the Oil-Rite Corp., 2332 Waldo Blvd., Manitowoc, Wisc. These oilers supplement the recently improved small capacity line produced by the same concern, which are featured in accompanying bulletin 61-1. Drawings, photos, tabular specifications.
Circle Inform-A-Gram No. B23.

Half An Inch of Switch Information, Widthwise, is contained in catalog 61A from the Micro-Switch Div. of Minneapolis-Honeywell Regulator Co., Freeport, Ill. Exhaustive listing of switches for industrial applications is given, invaluable to designer, purchasing agent, and executive. Complete schematic indexing of the 100 pager, which also contains price list, discount schedule, and supplementary data sheets.
Circle Inform-A-Gram No. B24.

15 Page Catalog from the Alina Corp., 401 Broadway, New York 4, N. Y., contains details of the complete line of precision Etalon measuring instruments, features such items as a dial micrometer that will measure an anvil movement of 1/100000".
Circle Inform-A-Gram No. B25.

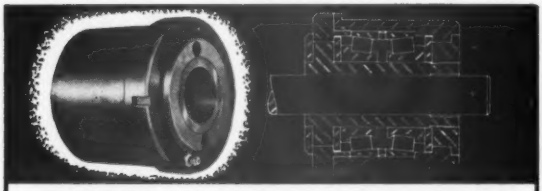
New Dumore Grinder Eliminates hand sharpening of small drills, has speed, versatility, and complete accuracy. Literature from the Dumore Company has full data.
Circle Inform-A-Gram No. B26.

New Model J-24 Band Saw is described in a folder just released by W. F. Wells & Sons, Three Rivers, Mich. This is a large capacity saw, fully hydraulic in operation, with a capacity of 24" by 24". Overall size of the unit is kept down by special arrangement of the cutting head.
Circle Inform-A-Gram No. B27.

72 Pager from Morton Machine Works., Detroit 20, Mich., is fully illustrated, gives full data on an exhaustive listing of fixture clamps and components. All products cadmium plated and specially treated for corrosion resistance.
Circle Inform-A-Gram No. B28.

Heat-Treating Equipment is featured in a new catalog, (No. 52.) from the Pressed Steel Company, Wilkes-Barre, Pa. Containers, fixtures, and retorts are featured with a collection of installation views of new equipment for saving handling and heating time. Tubing types for annealing, firing furnaces, venting, and thermocouple protection are also described.
Circle Inform-A-Gram No. B29.

"Grip-Master" Fixture Lock is easily adjusted to jig requirements, gives positive locking in single motion. Details from National Tool Co., Dept. 132-K Racine, Wis.
Circle Inform-A-Gram No. B30.



THE ONLY PILOT BEARING BUSHING WITH ABSOLUTE SEAL AGAINST COOLANT AND GRIT!

True—absolutely true—the Jergens Pilot Bushing provides complete sealing against abrasive grits and dust or other damaging materials entering into the roller bearing cavity. Amazing as it seems the entry of grit into the outer seal actually increases the effectiveness of the seal. Furthermore, this revolutionary bushing provides greater bearing accuracy—bushing stability and the first long lasting, complete seal in the roller bearing field.

SEND FOR CATALOG No. TP-12

PERFORMANCE FEATURES
* Absolute seal against coolants, grit and dust
* Bearings can be dissembled without removing housing
* Cartridge-type bearing holder provides greater accuracy
* Protects against thrust loads as well as radial
* Tapered bearings can be adjusted to compensate for wear
* Adaptable to receive removable slip bushings
* Adaptable to receive keys or keyways
* Can be furnished with shafts to use as pressure rolls

J. G. JERGENS CO.
11106 AVON AVE • CLEVELAND 5, OHIO

Solution to Scale Removal Problem on a quench sizing operation is instanced in a 4 page case history bulletin from the Honan-Crane Corp., 208 Indianapolis Ave., Lebanon, Ind. Manual cleaning was reduced 80%, annual savings totalled $2,000.
Circle Inform-A-Gram No. B31.

All Types Holding Fixtures for machine shop production are described in exhaustive catalog from Swartz Tool Products Co., Inc., Detroit. Paramount interest to designers and builders.
Circle Inform-A-Gram No. B32.

Two Types of Quality Control Chart Holders are featured in new bulletin No. 159-22 from the Visi-Trol Corp., 9345 Hubbell Ave., Detroit 28, Mich. Included are specifications and descriptions of type "A" holders for "in process" records and type "B" holders for permanent records. Copies available to readers.
Circle Inform-A-Gram No. B33.

Huot Drill Dispenser is described in circular now available from Huot Mfg. Co., St. Paul 5, Minn. Entire drill stock seen at a glance.
Circle Inform-A-Gram No. B34.

AIR-MITE AIR ARBOR PRESSES

(AIR OR SPRING RETURN)

Completely Flexible

AIR-MITE now supplies solid steel upright columns in any lengths required to give you these important flexibility features:

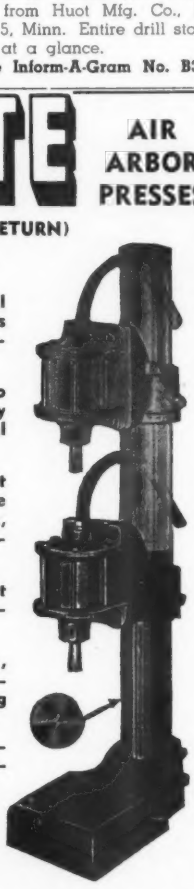
1 Normal ram clearance of 0" to 6" may be increased to any clearance required for special application.

2 Supplementary or replacement cylinders with any ram stroke required are available for quick, easy mounting on same brackets.

3 Rapid socket wrench adjustment cylinder bracket swivels for perfect alignment with work.

Presses are available in ¼, ½, ¾ and 1 ton capacities—for staking, riveting, marking, punching and similar operations.

Write for complete catalog of Air-Arbor Presses and single and double acting Air Cylinders.



AIR-MITE
4417-B West Carroll Ave.
Chicago 24, Ill.

Attention Tool and Die Men! New Model 84 Rivett small hole grinder converts easily for external grinding. Catalog 84A, just off the press, describes such features as interchangeable wheelheads, lathe type spindle for direct draw-in collet and step-chuck mounting, swivel workhead and table for taper grinding. Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass.
Circle Inform-A-Gram No. B35.

"Berliss Roller Bearings is title of new 16 page catalog No. 522 just released by the Berliss Bearing Co., 14018 Carmer Ave., Belleville 9, N. J. Complete description of rollers, bearings, roller assemblies cage and split outer race assemblies is presented together with bearing selection data covering load speed factor, stationary shaft factor and bearing life with shaft and housing limits.
Circle Inform-A-Gram No. B36.

Drill Stops—a positive control for depth of hole—are described and illustrated in a new 4 page bulletin No. 18-50 from Scully-Jones & Co., 1913 So. Rockwell St., Chicago 8. Listing and pricing of standard stock sizes, plus section on specials with applications.
Circle Inform-A-Gram No. B37.

New Booklet Available on X-Ray Analysis. Shows operation principles for three instruments, gives application data, indicates results to be expected. North American Philips Co., Inc., 750 S. Fulton Ave., Mount Vernon, N. Y.
Circle Inform-A-Gram No. B38.

Type M2C Autronic Manual Control for remote operation of final control elements is described in a four page bulletin just announced by the Swartwout Co., 18511 Euclid Ave., Cleveland 12, Ohio. The catalog is printed in two colors, illustrated with photographs, phantom and schematic views, gives features, operating principle, performance characteristics. Bulletin. A-705.
Circle Inform-A-Gram No. B39.

New Line of Standard Cutting Tools has just been announced by Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill. The new line will be distributed under the name ILLINITE, and will include such items as standard end mills; saws; milling cutters; key slot cutters; hobs; shaper cutters; gear measuring blocks; tool bits; die filing machines and die files.
Circle Inform-A-Gram No. B40.

An Interesting Publication in the field of heavy machinery has just come off the press for the Midwest (Chicago) Div., Lombard Corp., Avenue Bank Bldg., Oak Park, Ill. This catalog TP-52 deals with the design and construction of complete metal extrusion plants, hydraulic presses, rolling mill equipment, and related process units. Presses from 600 to 20,000 tons.
Circle Inform-A-Gram No. B41.

Jeweled, Dust Proof, Shock Proof, the No. 1D dial indicator from the Alina Corp., 401 Broadway, New York 4, N. Y. has a range of .4", with graduations of .0005" and an accuracy of .0004" over complete range. Folder now available.
Circle Inform-A-Gram No. B42.

A New Bulletin on Gas-Fired and Electric Super Cyclone Furnaces has just been issued by the Lindberg Engineering Co., 2450 W. Hubbard St., Chicago 12, Ill. Operation, design features, and applications are briefly explained by photographs, diagrams, and specification charts.
Circle Inform-A-Gram No. B43.

Glenny Adjustable Push Broaches are described in the latest catalog from Kase Machine Co., 18430 Nottingham Rd., Cleveland 19, Ohio. Without expensive time consuming set-up this equipment will cut keyways accurate to plus or minus .0005" on your arbor press. Full engineering data for complete size range.
Circle Inform-A-Gram No. B44.

A Heavy Duty Anti-Weld Soluble Oil is now being produced by the Motch & Merryweather Machinery Co., Cleveland, for machine tool use. It deters welding and pick-up, prevents rust. Smokeless and odorless.
Circle Inform-A-Gram No. B45.

Data Sheet from Alina Corporation, 401 Broadway, New York 4, N. Y. gives details on a selection from the range of universal vernier calipers now available for distribution. Makes selection for your need particularly easy.
Circle Inform-A-Gram No. B46.

Brochure from Baker, — the Baker Co., Maplewood, Maine —has well organized data and details on a line of instrument bearing tools and equipment, includes bearing handling, assembly, cleaning and testing tools. Fully illustrated.
Circle Inform-A-Gram No. B47.

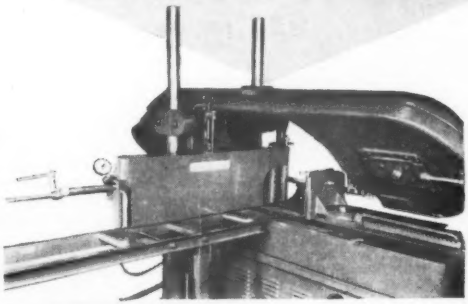
New Metal Slitting Saw Catalog from North American Products Co., 3100 W. Cherry St., Milwaukee 8, Wis., illustrates and describes the Woodsman carbide tipped slitting and slotting saw. Full performance and ordering data given.
Circle Inform-A-Gram No. B48.

For repetitive cutting...

THIS COMBINATION SAVES TIME AND MONEY

ANY quantity of identical lengths of bar stock are cut automatically in a Wells No. 12 Heavy Duty Metal Cutting Band Saw equipped with a Wells-O-Bar Feed Master.

In operation, the cutting head of the saw descends at a rate governed by a predetermined blade pressure setting. At the completion of each cut, the head automatically rises to a preset height and the stock is automatically projected for the next cut. The machine requires no attention except for reloading. Ask your Wells Dealer for complete information or write direct.



Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
1040 CEDAR ST., THREE RIVERS, MICH.

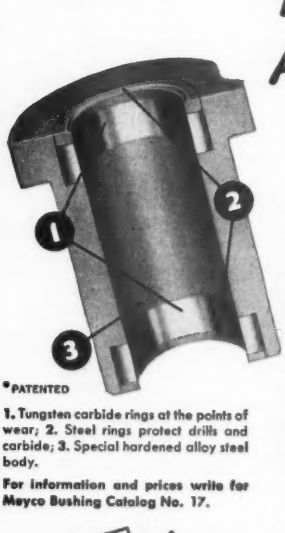
New Automatic Press Equipment Assures automatic uniformity of mechanical accuracy and grinding characteristics of the comprehensive line of internal grinding wheels in bulletin ESA-29 from Simonds Abrasive Co., Tacony and Fraley Streets, Philadelphia 37, Pa. Grain and grade job recommendations included.
Circle Inform-A-Gram No. B49.

Free Samples of Industrial Padded Shipping Bags now available from Jiffy Mfg. Co., 360 Florence Ave., Hillside, N. J. Afford complete protection from dirt, dust, moisture.
Circle Inform-A-Gram No. B50.

Oilers, Oil Cups, Vent Tubes, Tube Forms, Assemblies. Comprehensive listing is contained in new 22 pager from Eynon-Dakin Co., 9900 Freeland Ave., Detroit 27, Mich. Graphic illustration plus clear chart form specifications and pictorial index speed selection.
Circle Inform-A-Gram No. B51.

Angle - Tangent - to - Radius Forms can be set up in minutes with controlled accuracy with the new "Tangi-Matic" dresser described in literature which you may now get from Perfex Gage & Tool Co., Mt. Clemens, Mich. Complete data furnished.
Circle Inform-A-Gram No. B52.

MORE HOLES—
MORE ACCURACY—
FASTER—
AT LESS COST



MEYCO
Carbide Inserted Bushings
Are Doing It Daily!

HOW? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that come close to the prices of ordinary steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

*PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

For information and prices write for Meyco Bushing Catalog No. 17.

W. F. MEYERS CO., INC., BEDFORD, INDIANA

Complete Flexible Tubing Line, in diameters from less than 1 to 30", for portable and semi-permanent ventilation service, fume removal, dust collection and materials handling is described in new catalog C2-3 from the Flexible Tubing Corp., Guilford, Conn.
Circle Inform-A-Gram No. B53.

"Ferrofilter" Permanent Magnet Separator is discussed in a new bulletin 92 from S. G. Frantz Co., Inc., Engineers, Trenton 6, N. J. Full installation and dimensional data given on this packaged unit for removing ferrous particles and chips from lubricating, coolant, and hydraulic systems of machine tools and plant equipment.
Circle Inform-A-Gram No. B54.

Information On Industrial Freezers and complete temperature range testing units is now available from the Industrial Freezer Div., Webber Appliance Co., Inc., 2740 Madison Ave., Indianapolis 3, Ind. Twelve models illustrate the range of 36 standard units; performance characteristics, sizes, temperature ranges and applications all fully detailed.
Circle Inform-A-Gram No. B55.

New Bulletin #731 describes the complete line of air cylinders manufactured by the Lindberg Engineering Co., 2450 W. Hubbard St., Chicago 12, Ill. Diagrams, charts, and photographs explain the capacity, type of mounting, etc. Listing of engineering features also included.
Circle Inform-A-Gram No. B56.

Booklet "Coordinated Machine Engineering" describes the details of the Barnes machine tool building service, illustrates the most modern in machines and mass production techniques. Sections include such subjects as special machine tools; special handling and conveying equipment; special sorting assembling, gauging and allied equipment. W. F. & John Barnes Co., 301 S. Water St., Rockford, Ill.
Circle Inform-A-Gram No. B57.

New Tool and Die Maker's Accessories Catalog. Producto dowel pins, die springs, stripper bolts and cap screws are conveniently listed in an eight page catalog recently published by the Producto Machine Co., Bridgeport 1, Conn. Also a line of toolroom equipment, technical drawings, specifications.

Circle Inform-A-Gram No. B58.

23 Pictures, Sketches, and Brief Specifications illustrate the complete line of Landis Precision cylindrical grinding machines in a new catalog. Universal, plain, and single purpose high production type grinders are included. From the Landis Tool Co., Waynesboro, Pa.

Circle Inform-A-Gram No. B59.

Quick, 3-Step Metallizing Process that produces superhard oil holding surfaces at low cost with new Sprabond wire is subject of a bulletin from Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City 1, N. Y. Application data, microphotos, engineering drawings.

Circle Inform-A-Gram No. B60.

Thin and Regular Locknuts are described by Standard Pressed Steel Co., Box 600, Jenkintown, Pa., in a new 26 page hard bound catalog. Sizes, fits, part numbers, dimensions, tensile values, materials, packing quantities and weights are listed in the catalog for all Flexlocs in both thin and regular design for aircraft and commercial use.

Circle Inform-A-Gram No. B61.

Universal Tool and Cutter Grinder distributed by Morey Machinery Co., Inc., 410 Broome St., New York 13, N. Y. is described in new folder. With attachments it can be used as tool grinder, cutter grinder, cylindrical, internal and surface grinder, and also for grinding twist drills, radial grinding and relief work.

Circle Inform-A-Gram No. B62.

1953 General Catalog from the Cincinnati Milling Machine Company, Cincinnati 9, Ohio, is now available to T & P readers. It contains 52 pages, is generously illustrated with photographs, phantoms, engineering drawings, etc. Cincinnati Milling's new Hydroform machine is featured. Also included are machines for: milling; lapping; grinding; broaching; die sinking; metal forming; flame hardening; cutter sharpening. Also section on grinding wheels and cutting fluid. Write for your copy of this comprehensive study now.

Circle Inform-A-Gram No. B63.

8 Page Bulletin describes line of sheet materials handling equipment, covers the newly patented "Stripveyor" and Liftveyor." Full operating data with explanative diagrams and photographs. Fried Steel Equipment Mfg. Corp., 529 E. 119 St., New York, N. Y.

Circle Inform-A-Gram No. B64.

Stationary and Portable Toggle Clamps for many different time saving applications are described in the newest catalog from Detroit Stamping Co. Over 40 models, holding pressures to 4000 pounds.

Circle Inform-A-Gram No. B65.

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LIVE CENTERS
Run lathes faster—make deeper cuts. No gouging, burning or spoilage. Highest accuracy. Male, Female and Pipe points. Also Heavy Duty Models.

ELECTRIC ETCHERS
Easy as using a pencil to etch iron, steel or their alloys. Burns smooth, permanent mark. Ends cost and delay of special name plates. Safe, portable—3 models.

DEMAGNETIZERS
Demagnetize tools, punches, dies, drills, work from magnetic chucks. Prolongs tool life. Three models.

ELECTRIC TACHOMETERS
Quick, convenient. Two sizes—2500 and 5000 RPM.

"XPAND-O-LAP"
Self-aligning, self-expanding laps.

Sold Through America's Leading Distributors

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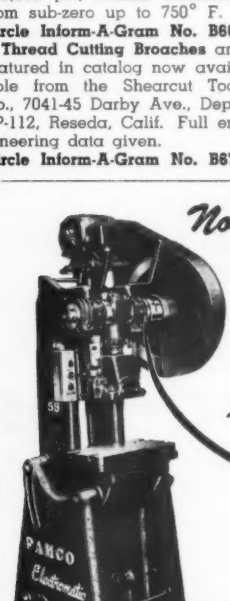
Molybdenum Disulfide is base of new "Anti-Seize," lubricant just developed by the Bel-Ray Co., Inc., Madison, N. J. Four page illuminated bulletin gives detailed and pictorial description of a range of applications. Will prevent seizing and galling at bearing pressures over 100,000 psi, retains efficiency from sub-zero up to 750° F.
Circle Inform-A-Gram No. B66.

Thread Cutting Broaches are featured in catalog now available from the Shearcut Tool Co., 7041-45 Darby Ave., Dept. TP-112, Reseda, Calif. Full engineering data given.
Circle Inform-A-Gram No. B67.

Wire Punches. Folder gives data on HSS punches for close tolerance small dia. holes closely spaced; 70 standard sizes between .032" and .189" available from stock. Others quoted special. Dayton Punch & Insert Co., 921-27 Valley St., Dayton 4, Ohio.
Circle Inform-A-Gram No. B68.

Time Saving Fixtures and Bars are typical of Bunell tooling described together with services, facilities and equipment in the current catalog from Bunell Machine & Tool Co., 1600 E. 24th St., Cleveland 14, Ohio.
Circle Inform-A-Gram No. B69.



Now! **A NEW CONCEPT IN POWER PRESS OPERATION . . . .**

Pictured is Famco's 18-ton open-back, inclinable power press featuring the exclusive Electromatic clutch.

SOLENOID OPERATED CLUTCH

famco
Electromatic
18-TON POWER PRESS

CHECK THESE FEATURES

1. EFFICIENCY—Solenoid operated, positive-locking, 9-point clutch jaws for greater efficiency.
2. ECONOMY—Less maintenance; minimum production time losses.
3. SAFETY—Electrically controlled for safe operation, tooling.
4. LONG LIFE—Proved design, rugged, longer-lasting press.
5. EASE OF OPERATION—Feather-light foot or hand control.
6. SIMPLIFIED CLUTCH CONTROL—Selector switch for single-stroke, neutral, or continuous operation, while press is or is not running.

Famco now offers the most fool-proof, small power press clutch ever designed—the solenoid operated, nine-point jaw clutch. The handy selector switch provides ready changeability from non-repeat single stroke to continuous operation—from on to off positions—plus, a neutral position which locks the clutch, making hand or foot controls inoperative.

The Electromatic 18-ton Power Press gives the greatest versatility and ease of operation, resulting in increased efficiency and production. For further details contact your Dealer, or write for catalog.

famco (COST CUTTING) **machines**

Famco Machine Co. • 3124 Sheridan Rd. • Kenosha, Wis.

Precision Feed by Oil Displacement is feature of the Hydro-Borer machines described in new catalog from the Hydro-Borer Co., 1601 E. Olympic, Los Angeles 21, Calif. May be used as integral unit or mounted on standard machine tools.
Circle Inform-A-Gram No. B70.

Palnut Lock Nuts for heavy assemblies and severe vibration conditions are described in bulletin #577 from Palnut Co., 61 Cordier St., Irvington 11, N. J. Outlines locking principle applications, advantages, assembly methods, materials, finishes and sizes.
Circle Inform-A-Gram No. B71.

Motorized Spindles of all kinds are featured in a catalog now available from The Standard Electrical Tool Co., Mt. Hope and Sixth Sts., Cincinnati 4, Ohio. More than seven different styles are produced for second operation work on planer, lathe, boring mill, etc.
Circle Inform-A-Gram No. B72.

High Speed Horn Press #55 Model G by Perkins Machine Co., Warren, Mass., is heavy-duty, versatile, and features an adjustable bed. Specifications include 45 ton capacity; 22½" by 26" bed; stroke as ordered to a maximum of 7" (standard 3"). Distance between gibs 11½", center to back 12½".
Circle Inform-A-Gram No. B73.

Jig Grinding Attachment for jig borer or mill by the Vulcan Tool Co., Pritz St., Dayton 10, Ohio, is compact, air driven and cooled, and will produce 10 micro finishes using carbide mills, five micro finishes with mounted points. Spindle speeds may be infinitely controlled between 30,000 and 65,000 rpm. The attachment is dependably accurate to "tenths", will finish grind in hardened steel to just that tolerance. New manual instances many profusely illustrated applications, is now available to our readers.
Circle Inform-A-Gram No. B74.

Index Vertical and Horizontal Milling Machines are described in literature currently available from Index Machine Co., 541 N. Mechanic St., Jackson, Mich. High precision and production are combined with low original and maintenance cost throughout the line.

Circle Inform-A-Gram No. B75.

Live Center Line by Ideal Industries, Inc., 4151 Park Ave., Sycamore, Ill., permit fast running of your lathe, eliminate gouging, burning, or spoilage. Made in range of male, female, and pipe points, and also in heavy-duty style.

Circle Inform-A-Gram No. B76.

Abrasive Performance Figures and Facts are set out in new literature from Minnesota Mining and Manufacturing Co., Dept. TP 122, St. Paul 6, Minn. Complete information is given on the line of 3M abrasive belts performing in cost-cutting applications.

Circle Inform-A-Gram No. B77.

Lever, Screw, and Air Feed Models of the Nichols Miller are featured in latest catalog from the Nichols-Morris Corp., 50-X Church St., New York 7, N. Y., together with three types of double spindle machines. Versatile rise and fall spindle heads can be locked in fixed position, or floated for profiling, broaching, drilling, keysetting, and similar plunge-cutting operations.

Circle Inform-A-Gram No. B78.

Hardness Conversion Wall Chart from Clark Instrument, Inc., 10208 Ford Rd., Dearborn, Mich., may now be had free of charge by readers through the Inform-A-Gram card. It's printed on heavy stock, and has all necessary data in easy-to-read tabular form. Get your copy now. Complete information is also available on the Clark line of Standard and Superficial hardness testers.

Circle Inform-A-Gram No. B79.

Attachment for 2 and 3 Dimensional Engraving Machines gives precision work at any angle, assures speed and accuracy. Tracer control with rotary table performance. Fryer Tools and Instruments, 188 N. Wells St., Chicago 6.

Circle Inform-A-Gram No. B80.

"Measuray" is X-Ray equipment by Sheffield Corp., Measuray Sales Div., Dayton 1, Ohio, for non-destructive non-contact continuous or intermittent thickness measuring. Equipment now has thickness setting dials, requires no masters. Catalog MY-52-3 has complete data.

Circle Inform-A-Gram No. B81.

Additional Sizes of Cut Thread Studs have been added to the stock listing of the Northwestern Tool & Engineering Co., 116 Hollier Ave., Dayton 3, Ohio. Range now covers studs from 2" to 20" long in 5/16-18; 3/8-16; 1/2-13; 5/8-11; 3/4-10; 7/8-9; and 1"-8.

Circle Inform-A-Gram No. B82.

Tap Grinding Machines and Attachments, Swiss-Made, are described in literature available from Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y. This equipment is for converting twist drill grinders to sharpen the start of all usual right and left hand taps.

Circle Inform-A-Gram No. B83.

How to solve
39 PRODUCTION PROBLEMS
with Mead Air Devices
Ready!
SEE how to use standard Mead units to make automatic or semi-automatic machines!
New 16-page Mead PHOTO-BOOKLET presents actual examples in pictures and text of 39 different, typical production problems solved by various combinations of Mead Air Operated Devices. Alert production men will readily adopt the ideas to their own needs. This interesting booklet shows how. Write today for booklet "Air Power at Work".
NEW MEAD PHOTO BOOKLET NOW READY!
Typical Work Pieces Handled
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AIR OPERATED DEVICES
Write for NEW "BOOKLET 39" Now!
MEAD SPECIALTIES CO., Dept. HA-122, 4114 N. Knox Ave., Chicago 41, Ill.

Brochure of Precision Die-Making Techniques may now be had by readers from the Harig Mfg. Corp., 5761 W. Howard St., Chicago 31, Ill. Full facilities and process information given.

Circle Inform-A-Gram No. B84.

Basic Circuit Diagrams and full explanation show connecting and operational principles of centralized lubrication systems in bulletin 529 from the Trabon Engineering Corp., 1814 E. 40th St., Cleveland 3, Ohio. Manifold and reversible systems for both oil and grease are described.

Circle Inform-A-Gram No. B85.

Comparison of Press Numbers Indicating Identical Sizes of Bliss, Toledo and Consolidated presses is given in a 32 page booklet recently issued by the E. W. Bliss Co., Canton, Ohio. It is intended to bring the reader up to date on the standardization of Bliss numbers.

Circle Inform-A-Gram No. B86.

Indicator Catalog from Tubular Micrometer Co., Box 30, St. James, Minn., has data on a complete line of dial indicators. Entire line has high-visibility reading for speed and accuracy. Very complete.

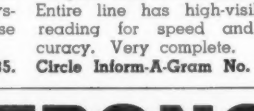
Circle Inform-A-Gram No. B87.

ARMSTRONG

CUTTER SERVICE

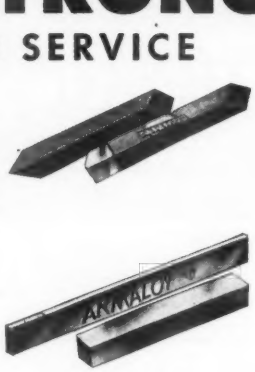
Whatever the cutting speed you need, no matter what the material to be machined, the ARMSTRONG System of Tool Holders provides correctly designed ARMSTRONG TOOL HOLDERS and cutters of proper type for the job.

For ordinary machining at the speeds indicated, we recommend:



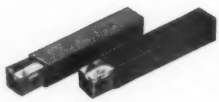
up to **150 f.p.m.**

ARMSTRONG HIGH SPEED Bits, Blades or Cutters in standard ARMSTRONG TOOL HOLDERS.



up to **300 f.p.m.**

ARMALLOY (cast alloy) Bits and Blades in ARMSTRONG *CA* TOOL HOLDERS.



up to **600 f.p.m.**

ARMIDE (Carbide-Tipped) Cutters in ARMSTRONG *Carbide* TOOL HOLDERS.

Armstrong Tools are stocked by Industrial Distributors

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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Eastern Warehouse and Sales Office
199 Lafayette St., New York, N. Y.
Western Warehouse and Sales Office
67 Eleventh St., San Francisco, Calif.

Hahn & Kolb Universal Tool and Cutter Grinder is fully specified in an illustrated folder from Morey Machinery Co., Inc., 410 Broome St., New York 13, N. Y. With extra equipment, this machine may also be used as a tool grinder, a cutter grinder, cylindrical, internal and surface grinder, as well as for grinding twist drills, radial grinding and relief work at any angle setting within 360°.

Circle Inform-A-Gram No. B88.

Electronic Measuring Equipment is detailed in an illustrated bulletin from Brown & Sharpe Mfg. Co., Providence 1, R. I. Among the equipment featured is an electronic amplifier for .0001" to .00001" readings; a special instrument for fast accurate setting of swivel table for straight or taper grinding; and a fixture which will measure internal angle accuracy to ± ½ seconds independently of bore size and without reference to a locating surface.

Circle Inform-A-Gram No. B89.

Conversion of Standard Machine Tools to automatic hydraulic duplicating is discussed and explained in a new 20 page fully illustrated booklet from the Turchan Follower Machine Co., 8259 Livernois, Detroit 4, Mich. Applications for mills, lathes, shapers, planers and grinders are all discussed. The easy way to increase machine versatility and production potential.

Circle Inform-A-Gram No. B90.

Danforth Diamond Powder In Sieve and Micron Sizes is specially closely graded and purified. A current prospectus from the C. W. Danforth Co., Box 448, Youngstown, Ohio, gives all data on this product line. In addition the prospectus contains details of complete diamond reclaiming services for sludges, used wheels, and lapping cotton. Catch up with the bort conservation drive and get a copy.

Circle Inform-A-Gram No. B91.

Bellows Air Motor Cylinder combines double-acting air cylinder, four way electrically operated directional valve, and speed regulating valve in one unit. Features also include complete elimination of lag between valve and piston movement, accurate speed control in both directions without power loss, compactness, and simplified installation procedure. New bulletin CL-30 gives all data with specifications, wiring diagrams, design and construction detail. The Bellows Co., 222 W. Market St., Akron 9, Ohio.
Circle inform-A-Gram No. B92.

Abrasive #3B Surface Grinder from the Abrasive Machine Tool Co., 16 Dunellen Rd., East Providence 14, R. I., has many precision features engineered for first-rate performance in close-tolerance work, in work demanding a good surface finish, and in work calling for the taking of heavy cuts. Descriptive bulletin and complete specifications available.
Circle Inform-A-Gram No. B93.

The Studer PSM-250 Grinds Profiles to 16" in One Setting. This machine is described in a catalog from the Cosa Corp., 405 Lexington Ave., New York 17. It is redesigned for increased capacity and features automatic tracer guide. Profiles can be ground to a tolerance of ± .0004", while closer limits are possible when employing large reduction ratios. Templates up to 24" long easily accommodated.
Circle Inform-A-Gram No. B94.

"ALX Alloy Tool Bits" is title of a valuable booklet now available from Allegheny-Ludlum Steel Corp., Wanda & Jarvis Avenues, Detroit 20, Mich. ALX tipped tools and solid bits perform in a speed range above that of high speed steel, but below that of carbide, and combine toughness, edge-strength, red-hardness, and abrasion-resistance. Booklet includes such helpful material as grinding procedure, tool angles, speeds and feeds and brazing of tips.
Circle Inform-A-Gram No. B95.

A Large Range of Work can be performed with Green Engraver, described complete with accessories and application data in a catalog from the Green Instrument Co., Inc., 385 Putnam Ave., Cambridge 39, Mass. Very versatile equipment.
Circle Inform-A-Gram No. B96.

Duplicating Equipment available from the Tracer Control Co., Hazel Park, Mich., has special features to permit universal application, will profile and contour on a production basis. Current catalog has all data.
Circle Inform-A-Gram No. B97.

Clamp Support Blocks from the Podlin Tool Co., 3918 Wesley Terrace, Schiller Park, Ill., give stable adjustment from a height of ½" to 10", are instantly adjustable, have only two parts.
Circle Inform-A-Gram No. B98.

Use and Ordering Information on Ground Flat Stock. Bulletin 52-803 from the DoALL Company, Des Plaines, Ill., gives such details as analysis, heat-treat and tempering data, plus tabular listing of sizes available from stock. Oil hardening tool steel.
Circle Inform-A-Gram No. B99.

Practically a complete grinding department in itself!

HAHN and KOLB WSRO UNIVERSAL TOOL and CUTTER GRINDER

Here's the most useful machine your grinding department can have . . . It does all the required work—and does it with precision, accuracy, speed and safety! With extra equipment it can be used as a tool grinder, a cutter grinder, cylindrical, internal and surface grinder . . . as well as for grinding twist drills, radial grinding and relief work at any angle setting within 360°.

Built in Germany to American specifications and measurements, the WSRO is sturdily constructed to give complete satisfaction wherever it is used. *Tooling interchangeable with American machine tools.*

Write today for illustrated folder giving full specifications

PARTIAL LIST OF SPECIFICATIONS

Long. movement of the table	16"
Cross movement of the table	10"
Cylindrical grinding length	8-4/5"
Maximum swing over table	10"
Maximum grinding wheel	7"
Spindle speeds	3000 to 6000
Motor	1 HP

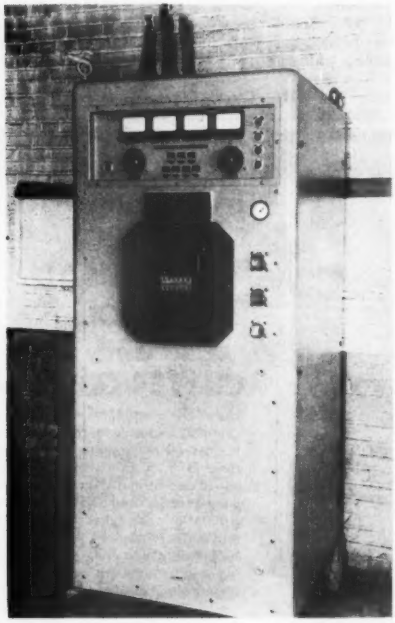
PROMPT DELIVERY • NO PRIORITIES REQUIRED

MOREY ...for machine tools!

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
410 BROOME STREET • NEW YORK 13, N. Y.
CANAL 6-7400 • CABLE ADDRESS: WOODWORK, N. Y.

Inserts Protect Threads Tapped in Soft Metals

Threads tapped directly in soft metal parts such as electrodes, bus bars and induction blocks present a problem of thread wear and thread stripping which has been solved by the use of stainless-steel wire thread inserts. When installed in soft materials such as copper, aluminum or magnesium, these thread inserts provide threads having higher loading strengths and greater resistance to wear and corrosion than unprotected threads tapped in the same materials.



Photos Courtesy Heli-Coil Corp.

Fig. 1. A Master Heating Station is equipped with transformer panel. Copper "fish tails" project through the panel. Tapped holes in the soft-metal "fish tails" require protection against wear as well as stripping.

An example of the manner in which this problem has been overcome is found in TOCCO induction heating units manufac-

(Continued on page 135)

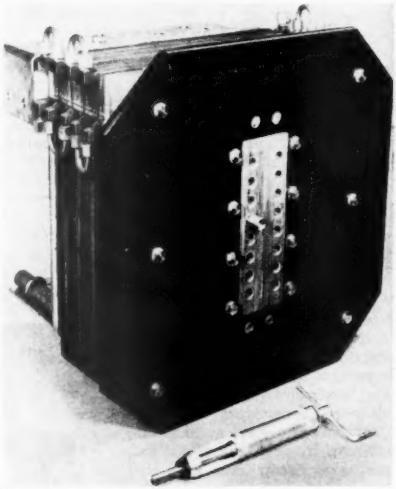


Fig. 2. Stainless-steel wire thread inserts reinforce the copper "fish tails" used to mount inductor blocks.

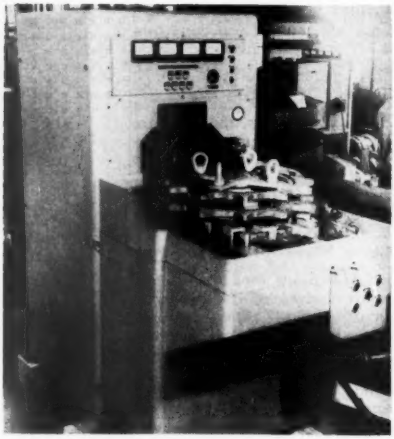


Fig. 3. A typical TOCCO installation utilizes a fixture located adjacent to the Heating Station transformer panel face. The fixture locates a sprocket during heating and hardening of teeth. Inductor blocks are securely mounted to the transformer panel with cap screws screwed into insert-protected tapped holes in the copper "fish tails".

SPECIFY KASSON PRECISION COLLETS AND ATTACHMENTS

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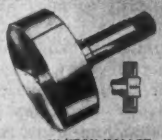
3AT, 3C
1A, 4C
5C



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All collets in hexagon, square and round.

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LEVER-TYPE DRAWBAR ½" cap.

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Ring Type or Press Fit

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Nickel Alloys Rolled to Ultra-Thin Gages

Rolling high-nickel alloys to precision-tolerances and ultra-thin gages, for use throughout industry, now constitutes a service by the Industrial Division, American Silver Company, Inc.

These metals (which include temperature compensation, low expansion, high permeability, glass sealing, and electrical resistor alloys), are now rolled to specifications by this company in strip up to 8 inches wide and down to .0005 inch thin—to tolerances as close as ± .0001 inch. The strip is rolled in either large or small quantities.

American Silver has equipped itself specifically to meet exacting requirements of this type—the "tough ones" that commercial mills ordinarily refuse to produce.

This service was developed by American Silver Company engineers to solve manufacturers' problems of obtaining high-precision and ultra-thin high-nickel alloy strip in development-laboratory quantities or high-production runs—to meet urgent, exacting demands, such as those of the current miniaturization program.

High-nickel alloys processed at American Silver include: nickel-iron, nickel-chrome, nickel-cobalt-iron, and nickel-molybdenum-iron. The ultra-thin, high-precision metal strip is produced on precision 2-High, 4-High, and Sendzimir rolling mills; on precision gang slitters; and through continuous atmosphere annealing lines.

Typical uses for high-nickel alloys include: speedometers in the automotive industry, navigation instruments in the aviation and marine industries, telemetering devices in the electric light and power industry, thermoswitches in the electrical industry, lead-in bushings in the electronics industry, thermostats in the household appliance industry; magnetic shields in the instrumentation industry, dynamic balancing machines in the machinery industry, locator parts in the radio industry, and audio transformers in the telephone and telegraph industry.

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We manufacture carbide drills and center drills for cutting hardened steel.
Representatives in all industrial areas.
National TOOL SALVAGE CO.
6511 Epworth Detroit 10, Mich.

. . . Inserts, from page 132

tured by the TOCCO Division of the Ohio Crankshaft Company.

Stainless-steel wire inserts, ⅜-16, are used in every tapped hole of the copper plates serving as transformer outlets. Projecting through the ebony-asbestos transformer panel, each set of outlet-plates has 12 to 16 protected cap-screw holes, depending on the particular model of induction heating unit.

Induction blocks, formed of square copper tubing, are secured directly to the transformer outlet-plates and form the "business-end" of each induction unit. These blocks must be removed frequently and replaced with induction blocks of varying size and shape, depending on the size and shape of the part to be treated.

Prior to specification of helical wire thread inserts as an integral part of the induction heating unit, high installation torque on cap screws stripped the unprotected copper threads in the transformer outlet plates. Even when extreme care was taken, the copper threads experienced excessive wear because of the frequency of interchange of inductor blocks.

The success of insert-use in the transformer outlet led this manufacturer to search for other applications. It was found that copper bus bars can be fastened more securely when tapped threads in the bus bars are protected with stainless-steel wire thread inserts. The inserts, providing substantially higher thread-flank contact, permit greater installation torque to be applied to connecting cap screws.

Another ingenious application, still in the experimental stage, is the protection of threads in insulating materials such as Transite.

Industry News

With scarcely a change in the external appearance of its plant at Longview, Washington, the Reynolds Metals Company has increased the installation's capacity from 60 million to 100 million pounds of pig aluminum per year, while maintaining aluminum production.

This was accomplished by enlarging the Longview plant's 372 reduction "pots"—electrolytic cells where alumina becomes metallic aluminum.

The pot structures were built by cutting them in two and expanding them by welding in joining sections. . . . thus "stretching" the pots to give greater capacity. They were then installed in the original buildings.

Zagar 5-C pull type collet
Hold on, there!
there's nothing better than a good watch-dog
Zagar 2" holding fixture
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Zagar FIXTURES, too!

When all is said, this is the first, middle and last consideration — that fixtures, holding and indexing, must HOLD. On that score, Zagars have qualified famously for years — in simple and intricate machining operations. Accurate construction gives accurate performance. Zagar also has a complete line of air-operated holding fixtures and collet lathe chucks. Prompt deliveries *NOW!*

Write for Engineering Manual T-12 ▶

ZAGAR TOOL, INC., 24000 Lakeland Blvd., Cleveland 23, O.

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

Plastic Draw Die Shapes High Alloy Automotive Panels

An innovation in the automotive industry, the use of a plastic die for production forming of large steel panels has been disclosed by Chrysler Corporation. First production tests at the Nine Mile Press Plant, Detroit, were highly successful. There, a draw die made of plastic instead of steel is being used in a standard 100-ton press to stamp steel cowl panels for Dodge trucks.

Close-up of the plastic form punch, showing well developed details.

Besides a saving in initial die cost, use of plastic dies promises to reduce the time required for tooling certain production operations. For example, the test die was produced in less than three weeks, as compared with 14 to 16 weeks normally required to make a comparable steel die.

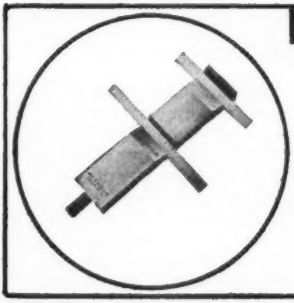
The plastic used in casting the test die is a thermosetting liquid phenolic material previously used with success by the aircraft industry. To increase the rigidity and strength of the tooling assembly, the plastic die is supported in a simple boxing fabricated from boiler plate.

One half of the plastic die was formed by pouring cold liquid plastic into a plastic mold of the truck cowl side panel. After being coated with wax to simulate the thickness of the finished steel piece, the same mold was used to cast the second half of the die.

Steel cowl panels are stacked after being stamped by a plastic die mounted in the 100-ton press shown.

Because the plastic material generates its own heat, hardening of the die was accomplished through its own chemical reaction. Curing of the die required less than 24 hours exposure to the heat from infra-red lamps. No machining of the die was required after it was formed or cured.

After experimental production run: In the foreground is the plastic punch; in the middle is the blankholder; and in the background the lower or die member of the assembly is being lowered to the floor.



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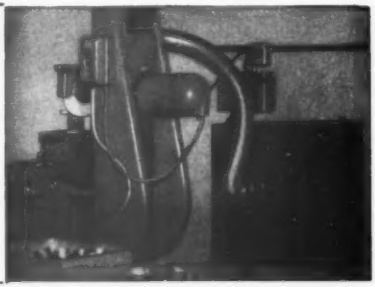

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

Guide Pin Covers Extend Die Life

In a comparative survey made recently among a group of the large industrial organizations using Elasticone guide pin covers on their metal forming dies, it was found that 25% greater average life was added to dies equipped with this protective covering.

The Elasticone guide pin cover is a spirally wound cone made of specially heat-treated alloy flat steel. Manufactured in a group of stock sizes to accommodate most industrial presses and die

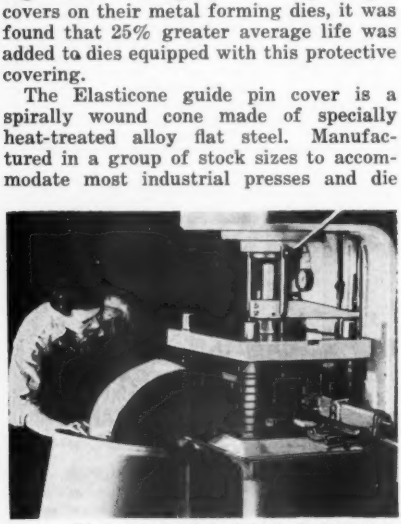

Photo courtesy Central Safety Equipment Co.

At the rate of 20,000 per day, this 35-ton Multipress produces mop clamps, using a roll-feed and 4-stage progressive dies mounted with Elasticone guide pin covers. Only casual supervision is required for this cost-cutting, all-automatic, all-around operation at the Stanley Home Products plant, East Hampton, Mass.

sets, it is easily snapped into place over the pins and bushings without the use of tools. It is retained in position by its inherent spring tension and does not require attachment to the die surface. It functions simply and is self-aligning. As the press opens and closes, the Elasticones move accordingly, its primary purpose being to eliminate the pinch point between the bushings and pins offering complete protection for the guide pins.

Since the introduction of these guide pin covers to industry almost three years ago, more than one million units have been sold. Wide acceptance of them by organizations such as E. G. Budd Co., Ford Motors, General Electric, General Motors, Westinghouse and many others, has been attributed to exhaustive tests conducted by the engineering departments of these firms. By installing these guide pin covers in presses that were in constant use, increased efficiency of the die was attained plus the life of the die set extended, without any sign of wear indicated on Elasticones. In addition, they offered complete protection to the guide pins against nicks and scratches, assuring the preservation of accurate alignment of the die set and at the same time protected the operator from possible injury. Lubrication and maintenance requirements were similarly reduced, while active production time increased, down time decreased.

In addition to increasing the average life of the die, they have produced considerable savings by eliminating the need for spare die sets on the critical dies, cutting the need for the partially finished spare die replacements. Since using these covers, most of the high production shops have found that they eliminated one of the serious problems of die breakage and thus reduced the possibility of important dies going out of service during a production run. This has led to a reduction in the number of replacement units that had to be prepared and kept available for production service.

Elasticones have opened new conceptions in engineering design, by providing the engineer with a freedom from the practical consideration of protecting the opening between guide pin and bushing. The engineers of many of the larger die users have been quick to seize this opportunity to design their die sets with shorter stub pins, no longer worrying about the possibility of cracked dies from misplaced work and scrap being forced into bushings, causing die breakage.

By providing the engineers with a practical method of controlling the pinch point of the pin and bushings and at the same time eliminating the possibilities of broken dies from this cause, they have been able to exercise considerable latitude in die design and thus reduce the cost of the original die, prolonging its service life (in some instances as much as 3 and 4 times). Savings of this kind are reflected

not only in the lowered cost of the die labor and material, but in the service life of the die and amount to many thousands of dollars on even a medium sized die program. In many instances, Elasticones have been responsible for providing engineers with a practical method of specifying closer fits and tolerances on their pin and bushing surfaces thus providing not only a precise die, but one that will give reasonable life performance and maintain its high precision. This has been particularly true on the multi-station dies that require a high degree of accuracy for perfection in alignment.

The simplification of maintenance and the reduction of die lubrication problems by the use of these covers, has also permitted longer, faster runs on multi-station dies, to the advantage of the user in press time, die time and lower production costs. In one instance, they made possible the combination of several presses under robot control that has now proven a practical method of automatic operation from raw material through finished products into the packaging stage.

Because of their relatively low cost, most users keep the guide pin covers on the die sets while they are in storage—continuing the protective purpose by overcoming rough handling, nicks and hazards during the dies' "out of press" time.

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MEN YOU SHOULD KNOW . . . . . .

H. PAGELS

F. C. MESSAROS

LELAND E. COULTER

IRVING R. TAYLOR

★

American Engineering Co., Philadelphia, Pa. announces the appointment of Mr. H. Pagels as vice president in charge of manufacturing, and of Mr. F. C. Messaros as vice president in charge of engineering. Mr. Pagels started his career in the machinery field in 1925, was chief process engineer of U. S. Rubber Co., and became works manager of American Engineering in 1945. Mr. Messaros has been associated with the company over the last 25 years, and since 1946 has been chief engineer in charge of research and engineering, pertaining to power plant, marine, fluid power, materials handling.

★

Leland E. Coulter has been named general manager of the R-B interchangeable punch and die activities for Allied Products Corp., which has recently completed the additions to its Hillsdale, Mich. plant. Peter C. Fortune has been transferred from Chicago to Detroit to be Mr. Coulter's assistant.

★

The appointment of Irving R. Taylor to the position of assistant manager of the Warren Machine & Die Div., of the American Welding & Mfg. Co., Warren, Ohio, is announced by E. C. Fales, Executive Vice President. Mr. Taylor was previously with the Taylor-Winfield Corp.

★

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. . . . . MEN YOU SHOULD KNOW

JOHN R. MARKEY

JOSEPH SUNNEN

E. E. VALY

ANDREW L. PONTIUS

★

John R. Markey has been named assistant to the vice president of the Aro Equipment Corp., of Bryan, Ohio, manufacturers of industrial tools, lubricating equipment and aircraft products. Before this promotion he had been aircraft sales manager.

★

Joseph Sunnen, founder and president of Sunnen Products Co., St. Louis, recently left for an extended tour of Central and South America. He will study the foreign Sunnen market, distribution methods, and business trends. The company manufactures automotive engine rebuilding equipment and industrial honing equipment.

★

E. E. Valy has been appointed distributor sales manager for the new Illinite line of standard cutting tools. He has been associated with Illinois Tool Works for 33 years. His offices will be located at the Chicago plant at 2501 North Keeler Ave.

★

Andrew L. Pontius has been appointed Shakeproof Division works manager for Illinois Tool Works. In this capacity he will direct all manufacturing and processing activities in the Divisional plants located in Elgin and Des Plaines, Ill. He was formerly director of manufacturing for A. B. Dick Co., and is active in the Society for the Advancement of Management.

★

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MEN YOU SHOULD KNOW . . . . . .

LANDON C. FUQUA

CHARLES W. BAKER

G. W. HULDRUM, Jr.

V. C. IRVINE

★

Landon C. Fuqua has been appointed a sales representative and assigned to the Chicago office by Standard Pressed Steel Co., Jenkintown, Pa. The Chicago district, with offices at 320 South Jefferson St., includes Illinois, Iowa, Minnesota, Missouri, Nebraska, Wisconsin, North Dakota, most of Indiana and Western Michigan. Fuqua joined SPS in 1939.

★

Charles W. Baker, formerly Milwaukee district manager for Chase Brass & Copper Co., Inc., has been appointed western regional manager with headquarters in Los Angeles. He will supervise Chase sales operation in eleven western states. He has been with the Company since 1929.

★

G. W. Huldrum Jr., has been appointed sales manager, Eastern Division, of Shell Chemical Corp., and V. C. Irvine has been named Western sales manager. Huldrum will supervise all sales activities east of the Rockies for Shell's solvents, resins, plastics and industrial chemicals. His office will be at 500 Fifth Ave., New York City. Irvine will head similar sales activities west of the Rockies, and his offices will be at 100 Bush St., San Francisco.

★

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. . . . . MEN YOU SHOULD KNOW

KENNETH R. BLAISDELL

REXFORD C. BURNHAM

MERLE E. KREMER

MATTHEW J. BETLEY

★

The appointment of Kenneth R. Blaisdell as field engineer in the Springfield, Mass. territory by the Bellows Co., was announced recently. Mr. Blaisdell will handle the sales and servicing of the complete line of air powered equipment, has a varied and practical experience in engineering design, production, and sales.

★

Rexford C. Burnham was recently appointed Hydraulic Div., Mgr. of the J. N. Fauver Co., Inc., Detroit. Mr. Burnham's experience includes four and a half years with Wright Aeronautical and six years with the Press Div. of French Oil Mill Machinery Co.

★

With the expansion of activities of the various divisions of Allied Products Corp., Frank H. Bishop, president, has announced several additions to the Corporation's executive staff. Merle E. Kremer, who was formerly associated with G.E., has been appointed Assistant to the President.

★

Matthew J. Betley was recently appointed works manager for the Aeroquip Corp., Jackson, Mich. Mr. Betley comes to Aeroquip from Sheboygan, Wis., where he was works mgr. for the Electric Sprayit Corp.

★

ANNOUNCING!

HEINRICH SCREWLESS *Grip-Master*

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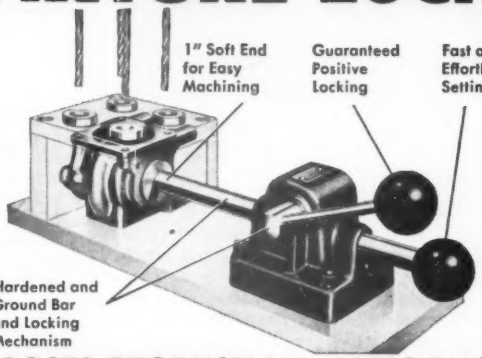
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NATIONAL MACHINE TOOL COMPANY

DEPT. 132-M • RACINE, WISCONSIN

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Phenolic Masters Provide Assurance of Duplicating Accuracy on Repetitive Work

Whenever die-casting or plastic molds, for example, are to be produced by duplicating or pantographing, the first step is the manufacture of a master. Generally made by a highly skilled modelmaker from a drawing, the master is an exact replica of one side of the part to be molded. It is either the same size as the part, if it is to be used with a duplicator, or two or three times larger, if a pantograph is to be used.

During duplicating, there is great risk of damage to the master, if wood, plaster,

Fig. 1. Pouring liquid casting resin, to which a special hardening agent has been added, into a form box which contains a lead model of the object for which a multi-cavity steel mold is to be made. The lead model and the inside of the form box have previously been coated with a clear lacquer as a parting agent.

or other fragile materials are used in its manufacture. Occasionally, if only a single cavity is to be made, the tool maker can get away with a plaster master cast from a wood model; but, in the case of multi-cavity molds which require the repeated scraping contact of a stylus across the master surface, there is little possibility that it will stand up unless made from a rigid hard-surface material. Accordingly, most moldmakers specify a hardened steel master, which means that the modelmaker must work directly in steel. If cavities are to be duplicated or pantographed, a male model must be machined and a female master then produced by hobbing. All of this is very expensive; it requires

Fig. 2. After sufficient liquid resin has been poured into the form box to completely cover the lead model, the box is placed in an electric oven for a two-hour bake.

about three times the man-hours to produce a steel master as a wooden one.

Hard Material Needed

This situation naturally caused all toolmakers to attempt to find a material which could be cast around a wooden model, be strong enough and hard enough to withstand repeated scrapings from the stylus of a pantograph or duplicator, and at the same time have a minimum of shrinkage. The Banner Mold & Die Corp., Leominster, Mass., has found one solution to the problem. They are now pantographing many of their single and multi-cavity molds using a master cast from a special, quick-curing liquid phenolic casting resin known as Marblette. This tool company's modelmaker now works directly in wood and, after pre-sealing the finished wood surface to eliminate any possibility of porosity, delivers the finished model to Banner.

In many cases, the liquid phenolic material can be cast directly around the wood model; however, according to the Marbl-

(Continued on page 146)

RAYMAC
Solid Carbide
CENTERLAPS

Raymac Solid Carbide Centerlaps save time and money by eliminating costly dressing. They are designed to replace abrasive centerlaps and to lap centers in hardened steel. Constant maintenance of correct angle is featured.

Raymac Centerlaps can be used on any standard drill press, centerlapping machine or lathe at normal speeds.

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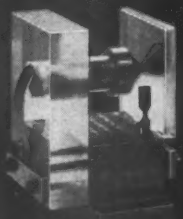

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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

. . . Phenolic Masters, from page 144

Fig. 3. After the core box and its contents are taken from the oven and allowed to cool, the lead model is easily removed from the cured phenolic master. Lacquer coating insures quick, clean release.

ette engineers, a lead model is more satisfactory. Accordingly, a plaster female is cast around the original wood model. Lead is then poured into the female plaster casting, and a male model results.

The illustrations herewith show the remaining steps in the master and mold making process, the procedure being the same whether a wood or lead model is used.

Fig. 4. With plastic master securely clamped in place on pantograph, the operator skillfully moves the ball point stylus over all the contours of pattern. As this is done, pantograph cutter produces precision cavity in steel plate in background.

Two-Hour Bake

A form box and the model are given a thin coat of clear lacquer, which serves as a suitable parting agent. The model is then placed in the bottom of the form box (Fig. 1), after which the water-clear liquid Marblette resin (with a special hardening agent already added) is poured into the box, covering the model completely. The form box is then placed in an electric oven (Fig. 2). Two hours of baking at a relatively high temperature completes the cure, after which the casting is allowed to cool to room temperature.

After cooling, only a slight tap on the bottom of the box is required to eject the cured phenolic master. Figure 3 shows the lead model and the female master. The master is next mounted on the pantograph (Fig. 4), and the operator proceeds to machine the multiple cavities of an injection mold in one piece of steel. The illustrated operation, known as pantographing, requires that the operator manually move the stylus over the entire surface of the master many times for the production of even one cavity. The same master is used for all the cavities; and, hence, if the cavities are to be identical in every respect, the details of the master must not be changed in the least by the repeated contact of the pantograph.

Figure 5 shows a partial test shot from the multi-cavity mold shown in Figure 4.

Fig. 5. Partial test shot produced in the multi-cavity mold shown being machined by pantographing in the illustrations in Fig. 4.

Photos courtesy Marblette Corp.

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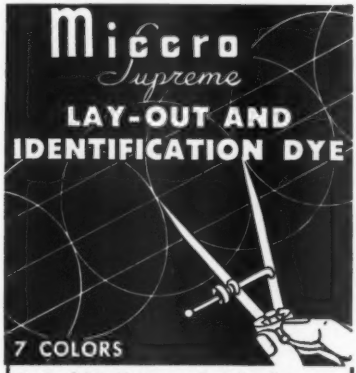

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New Exposition to Present Developments in Field of Basic Materials

An international exposition, first of its kind held anywhere, planned to meet the needs of industrial "worlds of tomorrow," by presenting under one roof the whole range of new materials flowing from the laboratories of industry and needed for product development, has been announced by Clapp & Poliak, Inc., New York.

Called "Exposition of Basic Materials for Industry," and described as "a new link in our industrial communications system" by Don G. Mitchell, president Sylvania Electric Products, Inc., who is chairman of the board of sponsors, the show will be held in New York, at Grand Central Palace, June 15 to 19, 1953. Top executives of 20 major companies are included in the sponsoring board.

Simultaneously with the exposition, a series of technical conferences will be conducted to discuss the properties and potentialities of the new materials which have such profound effect on both consumer products and industrial methods. The event is intended to create a new source of information and ideas for engineers, research scientists and executives by offering an integrated picture of the vast and complicated structure of materials fundamental to product development. With both conference and exhibits, the sessions are expected to provide the greatest clearing house for information about materials anywhere in the world.

More than 15,000 executives concerned with design and development of products are expected to attend from every major manufacturing center of the world. Almost 2,000 experts will be on hand to lead conference discussions and answer questions at exhibits.

Describing the exposition as one which will "open up the world of tomorrow for consumers everywhere," Mr. Mitchell declared that even large staffs of engineers are finding it impossible to keep abreast of vital new discoveries.

"New materials are being developed almost daily," Mr. Mitchell said. "A new textile designed to meet the needs of a tire manufacturer might find application in shoes, parachutes, furniture and packaging. A new

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plastic might find application in television sets, automobiles, toys and wall coverings. An electric appliance manufacturer must study dozens of different materials before he can decide on what to use just for his cabinet.

But it is not only consumer products which are undergoing a change. Jet propulsion, atomic power and huge increases in the speed of mechanical production are presenting problems in industrial materials almost undreamed of in the Thirties. What is needed is a quick exchange of information. At the exposition, under one roof, we can compare competitive claims and learn the peculiar properties of each. Meanwhile, at the conference, our product designers can learn of developments in prospect. It is a new link in our industrial communication system," Mr. Mitchell said.

Besides the emphasis on new materials, the exposition will demonstrate new uses for standard products, such as wood, metals, alloys, plastics, ceramics, textiles, leather, rubber, cork and glass. Product components and accessories will be featured. Also shown will be old materials in new forms such as laminations, coatings and sandwiches.

Serving with Mr. Mitchell on the board of sponsors will be John R. Hoover, president, B. F. Goorich Chemical Co.; R. S. Reynolds, Jr., president, Reynolds Metal Co.; Eugene C. Sullivan, honorary chairman of the board, Corning Glass Works; M. J. Donachie, president, Beryllium Corp.; Austin R. Zender, vice-president, Bridgeport Brass Co.,; Lawrence Ottinger, president, U. S. Plywood Corp.; Milton P. Higgins, president, Norton Co.; John Kruesi, president, American Lava Corp.; P. P. Alexander, president, Metal Hydrides, Inc.; Thomas B. Bancroft, president, Mt. Vernon-Woodbury Mills; M. A. Chapman, president, Mica Insulator Co.; George L. Bachner, president, Powdered Metal Products Corp. of America; Carl I. Collins, president, Superior Steel Corp.; Cornelius D. Dosker, president, Gamble Bros., Inc.; F. M. Daley, president, Sponge Rubber Products Co.; H. Collin Minton, Jr., president, Star Porcelain Co.; Semon H. Stupakoff, president, Stupakoff Ceramic & Manufacturing Co.; Dr. M. H. Meigham, director of research, Johnson Bronze Co.; and O. R. Cheatham, president, Georgia Pacific Plywood Co.

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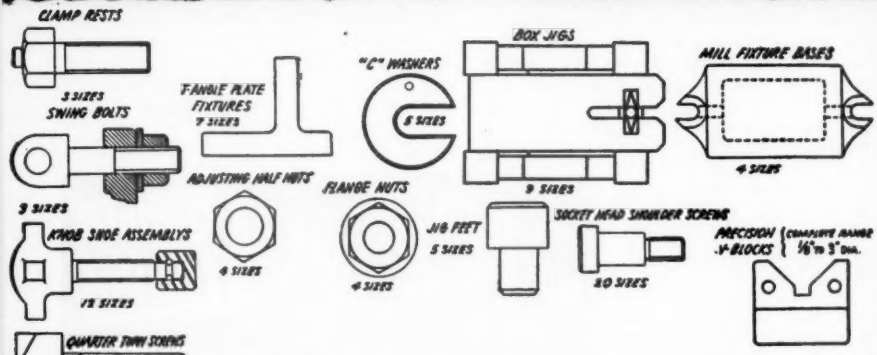

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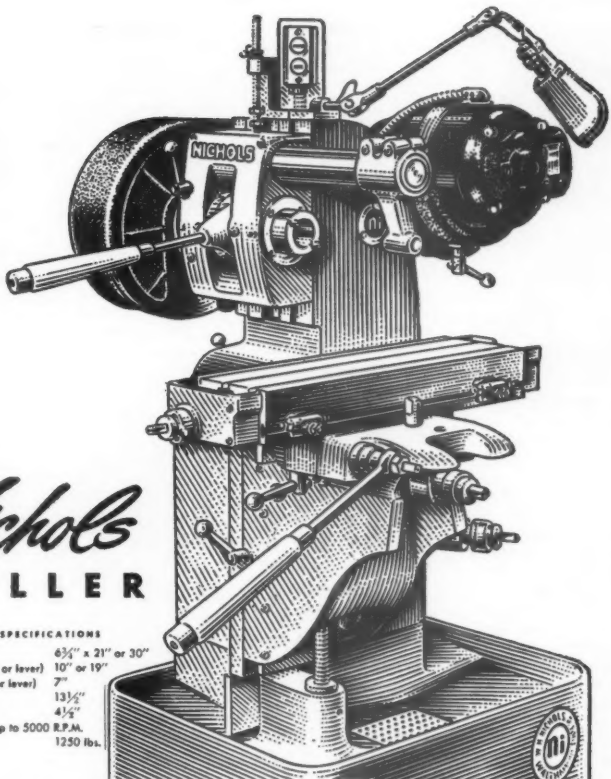

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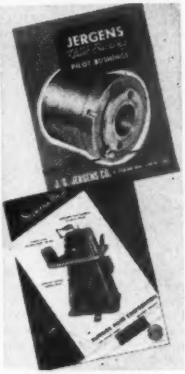

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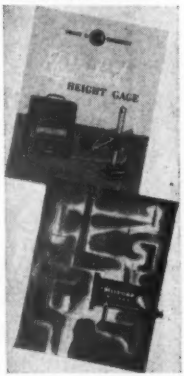

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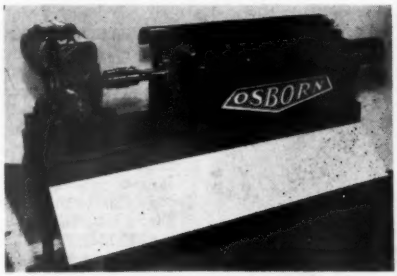


Fig. 1. This special brushing unit has been developed to clean conveyor belts. Many plants do not have the necessary experience or equipment to build brush driving and supporting equipment. To fill this basic need, this package was designed which does the complete job and produces the results required.

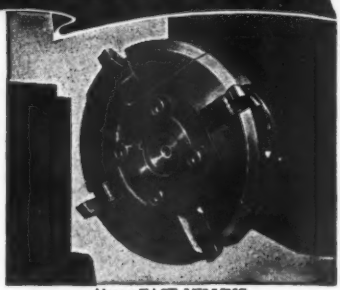
The full utilization of the potentials of power brushing has never been attained, largely because the development of machines which use brushes has not kept pace with the development of the brush and brush using opportunities. Because of lack of proper handling and use of these brushes, a series of brush assembly units have been developed that can easily fit into brush using machines that have many applications in industry.

Photos courtesy Osborn Manufacuturing Co.

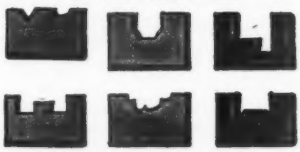
Fig. 2. This brushing unit was developed to protect the expensive brush from damage, and to facilitate handling larger size brushes. Brushes such as this one are used for cleaning and scrubing metal sheet or strip, and cleaning conveyor belts.

NEW-FIELD

UNIVERSAL FLY CUTTER



Above: FACE MILLING



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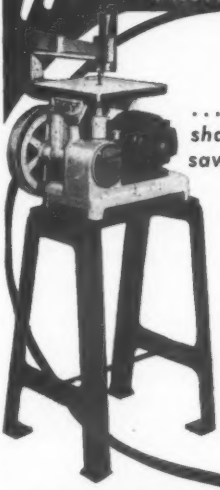

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Standard features include 20,000 or 30,000 R. P. M. spindle speeds, ½ H. P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser. Write for illustrated Bulletins and Prices.

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5-Way Drilling and Tapping Machine for Aircraft Jet Engine Housing Components

A new 5-way drilling machine designed for drilling jet engine housings features interchangeable multiple drill heads on two of the five stations which enables the production of several types of housings having a variety of bolt circle specifications on faces with identical radial locations.

Loading, clamping, and indexing of the housings in the fixture is done manually to meet the requirements of producing a precise part in relatively low production with minimum scrap.

In operation, the aluminum alloy jet engine housings are loaded in the fixture where they are located by an OD ring and a pin in a bolt hole. The fixture is rotated clockwise by hand to positions where individual hold-down clamps can be tightened.

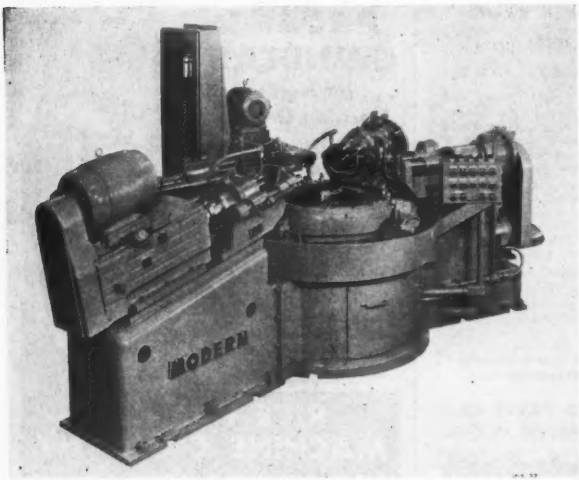
After clamping, the fixture is brought to starting position and the index lever operated to lock the fixture in place. With the actuation of the index lever, three air operated index table hold-down clamps are also applied. By pushing the reset button, a counter and circuit for predetermined automatic selection of head combinations are then set.

Indexing between operations is done manually by rotating the table after the index pin and clamping cylinders have been automatically released by the return stroke of the heads. The table is designed so that it can be indexed in a clockwise direction only and cannot be indexed past successive stations.

The index pin is again pushed into operating position after indexing and the table clamps energized. The cycle button is next operated and the correct heads begin to feed. Eight stations and nine operations complete the multiple drilling and multiple tapping of holes in the housing.

At the end of the cycle of operations, the fixture is free to be rotated for unclamping the part and unloading it. If tool breakage does occur at any point in the cycle of operations, a manual-automatic switch can be operated and the head can be jogged through successive positions without the heads feeding. An emergency return button is provided to return all heads to idle position.

This machine is powered by 3 and 5 hp. motors. It is 15 ft. wide, 8 ft. deep and 5½ ft. high, weighing 28,000 lbs.



A 5-way drilling and tapping machine designed for producing aircraft jet engine compressor housings. Two of the five stations have interchangeable multiple drill heads that enable the production of several types of housing designs. Nine manual indexes complete the multiple drilling and tapping of holes in the housing.

Photo courtesy Modern Industrial Engineering Co

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Los Angeles 17, California

Coated Abrasives Grind Wide Sheets To Close Limits

A surface grinder called the Curtin-Herbert Micro-Grinder, is being manufactured that will face wide web sheets of leather, plastic, felt, cork, rubber or metal, maintaining a thickness tolerance of ±0.0005 in. on the finished stock. Developed by Curtin-Herbert Company in cooperation with Behr-Manning Corporation, the machine produces this degree of accuracy through the use of a coated abrasive cover, spiral wound on a cast iron back-up roll. Machine widths range from 12 to 80 in. but widths of 40 to 42 in. are standard.

by **Dirck Olton**
Product Engineering Dept.
BEHR-MANNING CORPORATION
Troy, New York

Accuracy of the finish-ground web depends on the hardness of the material to be ground and the amount of the stock to be removed. On relatively soft non-metallics, 0.0625±0.0005 in of stock can be removed in one pass through the grinder. Extremely hard non-metallics, such as mica and laminated phenolic, have been given a 0.030±0.0005 cut at one pass.

The coated abrasive cover is spirally wound around a centrifugally-cast normalized cast iron drum that is machined to a tolerance of ±0.0005 in. The edges of the coated abrasive cover do not overlap but are butted together. This mounting technique for the drum cover permits utilization of the entire drum periphery.

Four clamps on each end of grinding roll hold the coated abrasive in place.

Coated abrasive cover being spiral wound on the cast iron roll. Seams are butted together hence do not overlap.

Either an oscillating or non-oscillating type drum can be used on the grinder. However, a more uniform finish is generated by the oscillating drum and the life of the coated abrasive is longer than on the non-oscillating drum. The grinding drum is completely enclosed and an exhaust duct built into the hood removes the swarf generated by grinding.

The web stock to be ground is fed into the grinding area by a series of rubber-covered pinch rolls. Mounted directly under the grinding roll is a precision ground steel billy roll that supports the stock as it is being ground. This billy roll is accurately adjusted vertically by two handwheels positioned on the operator's side of the machine. Either handwheel will actuate the worms and gears that move the billy roll up to the grinding drum. Moving either handwheel a full revolution will raise or lower the billy roll 0.005 in. A powered elevating mechanism with limit switches can be installed as optional equipment. A dial indicator, graduated in thousandths of an inch, is set on the feed table to provide a visual means of adjusting the cut.

For making adjustments that are finer than can be made with the dial indicator, graduated collars on the handwheels are marked in increments of 0.0001 in.

The billy roll is ground in the machine in order that it will be round and parallel to the grinding drum.

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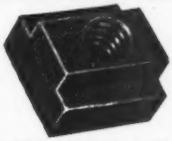

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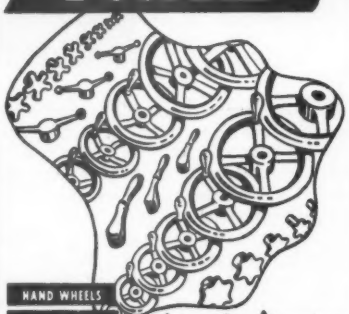

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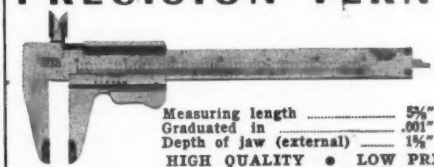

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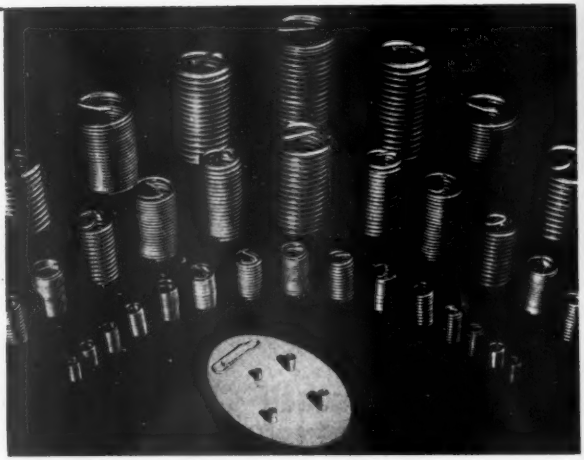
Heli-Coil Student Award Program



Heli-Coil Corporation of Danbury, Conn. —manufacturer of screw thread inserts for the protection and repair of tapped holes in all materials—announces the 1952 Heli-Coil Engineering Student Design Award Program.

This award program is open to resident engineering under-graduate students registered in any school, college or university in the United States and Canada which offers a curriculm in any branch of engineering leading to a degree. Cadets registered in the United States Military Academy, Naval Academy and Coast Guard Academy are also eligible.

Cash awards will be made for the most original or unique new uses for Heli-Coil thread inserts, as follows:

First Award	$1000
Second Award	500
Third Award	250
Merit Awards	100

The number of merit awards to be made will be determined by the contest judging board.

The purpose of the award program is two-fold:

(a) to encourage inventiveness and ingenuity among student engineers, and

(b) to supplement class work with practical industrial problems that will help prepare them for their transition into industry.

Students desiring to participate in this program must apply by postcard or letter to "Design Award Program," Heli-Coil Corporation, Danbury, Conn. They will then be registered as offcial participants and will receive complete engineering data and other necessary information by return mail.

The award program period is from October 1, 1952 through December 31, 1952. To be eligible for judging, entries must be postmarked no later than midnight December 31, 1952. A distinguished contest judging board—made up of design magazine editors, industrial designers, educators and industrialists—will appraise the entries on January 21, 1953. All participants will be notified promptly of the judges decision.

Each entry must contain a sketch of the student's original or unusual design on 8½ x 11-in. paper. Descriptions should be kept as short and "to the point" as possible. Any number of entries may be submitted, but only one award will be made to any entrant.

Entries will be judged on their original or unusual approach. In case of a tie between similar entries, the award will go to the one bearing the earliest postmark.

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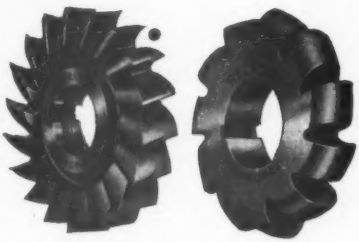

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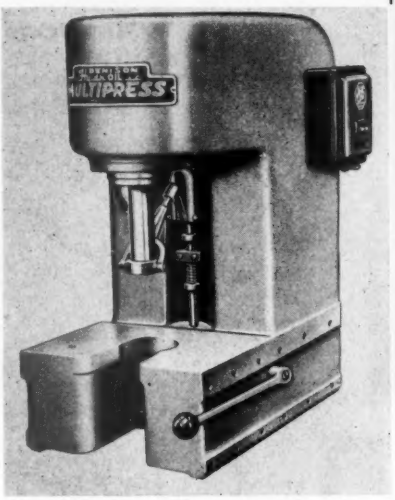
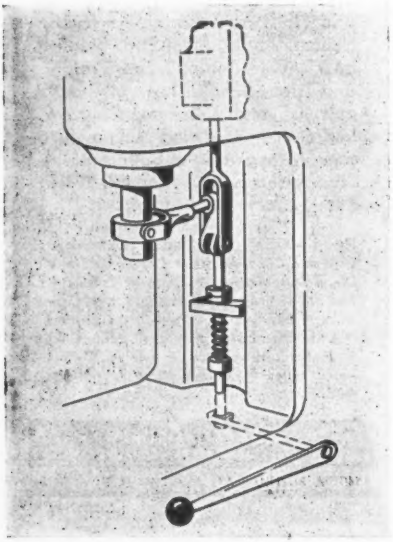
New Press "Touch Control"

A new, versatile type of control, for application on all models of the widely-used Multipress, has just been announced. To be known as "Touch Control" it is a servo-type valving in the oil hydraulic press circuit that through its unique linkage with the hand control gives "instant response" ram action. Extremely close control over ram speed is accomplished through a hand control lever. Whether the lever is pressed rapidly or slowly, the ram follows up to its maximum speed. To any kind of up and down motion—long, short, fast, slow—the ram responds instantly. Minimum ram stroke is about $\frac{1}{16}$"; maximum, six to fifteen inches, depending on the model of Multipress—neither the valving nor linkage restricting the stroke or daylight of the press.



Here's how it works: The hand lever is depressed which raises the shipper rod shown in sketch; this motion is transmitted through the clevis and yoke to the valve spool. The spool rises, opens the pressure port of the valve and the ram descends. The ram pulls the telescoping arm down at the same time. This tends to return the spool to its original closed position. The ram stops and remains stationary in a "neutral" position until the control lever is moved again.



Photos Courtesy The Denison Engineering Co.

When the ram contacts the work, it exerts just as much force as your hand dictates. The "Touch Control" gives the operator a "feel" that is second only to the use of his own hand directly on the work—if he were strong enough to do it. The pressure gauge on the press tells him the exact force needed to perform a certain job. For production line work the press can then be accurately set for continued application to that job-required pressure.

Other reported advantages of this "Touch Control" is that it allows fast ram approach to work—and then when the ram contacts the work, it can be inched carefully (avoiding sudden impact) to provide maximum safety for tooling and fixtures. It offers desirable controlability for varying conditions of die fill, material thickness, etc., as well as straightening, die try-outs, lab testing, and certain types of assembly—in fact any job that requires careful and individual control of ram speed and pressure.

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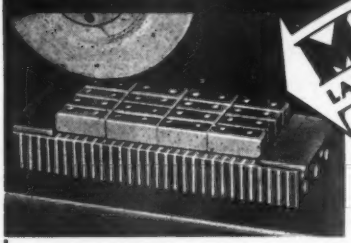

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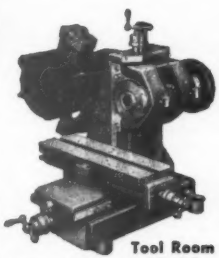

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New Edition of Thermocouple and Pyrometer accessories bulletin has just been published by Bristol Co., Waterbury 20, Conn. New technical information and installation sketches are included in the "Users's Manual" section, which also has engineering data on modern practices

in pyrometry, plus tabular calibration data for the commonly used base and rare metal thermocouples. The catalog section is extremely commendably organized, is made doubly useful by specific application data which forms a complete guide for buyers.
Circle Inform-A-Gram No. C1.

"Complete Guide to Successful Silver Brazing" has just been released as a second edition by the American Platinum Works, 231 New Jersey Railroad, Newark 5. N. J. It has 48 pages, with more than 50 drawings and charts, also a specially designed temperature calculating graph. It provides correct answers to all general questions on low temperature silver brazing, brazing alloys, joint design, preformed brazing shapes, plymetals, fluxing, heating methods, cleaning and inspection.
Circle Inform-A-Gram No. C2.

"Fundamentals of Steel Casting Design" is title of a brochure now available from the Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15, Ohio. Many interesting applications of steel castings compared with forgings and weldments are described. The booklet is fully illustrated, contains 32 pages, will be of paramount interest to designers and design engineers.
Circle Inform-A-Gram No. C3.

This Helpful Brochure from Carborundum Co., Niagara Falls, N. Y., has 86 pages of suggestions and specifications to assist you in identification, specification, ordering, application, and stocking of coated abrasive products for modern production methods. Charts, photos, diagrams, etc.

Inform-A-Gram No. C4.

Cast Iron and Cemented Carbide. Valuable aid on drilling cast iron with cemented carbide twist drills is given in Engineering bulletin GT-254, which may now be had from the Carboloy Dept. of General Electric Co., 11109 E. 8 Mile Rd., Detroit 32, Mich. Sections covered include the drill; — recommended grinds, etc. — drilling equipment; speeds and feeds; operating conditions; actual application practice; and cutting oils and coolants.
Circle Inform-A-Gram No. C5.

Surface Grinding Handbook from the Blanchard Machine Co., Cambridge 39, Mass., has 42 pages of charts, tables, and descriptive text. Detail coverage is given to correct wheel selection, bonds, handling and storage and recommendation. The section on operation of Blanchard grinders includes such features as work holding for high production, grinding nonmagnetic metals, convex and concave surfaces, clamping fixtures and finishes. Useful section has help on wheel data for figuring grinding costs. The handbook is pocket size, designed for easy reference.
Circle Inform-A-Gram No. C6.

Handbook — "Know Your Gear Shaper Cutters" — from Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill., gives design help in determining the form of any cutter for a specific job, is complete with engineering data, drawing-photographs, and tabular data for calculation purposes.
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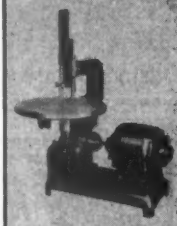

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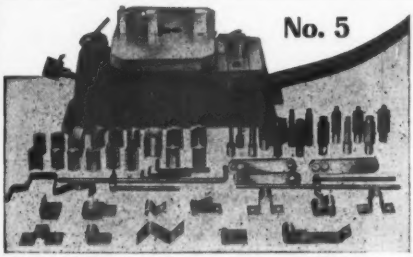

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Many Pictures Make for Interesting, Easy Digestion of a brochure from the Porter-Cable Machine Co., Syracuse, N. Y., on abrasive-belt machining applications for all industry. The brochure is developed round a 'case-hisory' theme, and each particular application provides stimulus to executive thinking along the lines of big production increases and cost reductions. Now available to our readers.
Circle Inform-A-Gram No. C8.

24 Page Pipe Thread Manual C-52 by Detroit Tap Tool Co., 8615 East 8-Mile Rd., Baseline, Mich., covers complete design information, gaging information, and specifications for the three major standard pipe thread systems, as well as specifications for taper and straight pipe taps, thread plug and ring gages and plain plug and ring gages. Well-selected tabular data aids reference. Also good sections on suggested tapping and gaging procedures and drill sizes.
Circle Inform-A-Gram No. C9.

"Polishing Cloth & Abrasives" is title of a pocket-size booklet now available from Buehler Ltd., 165 West Wacker Drive, Chicago 1, Ill.; has been successfully designed to serve as a working aid to purchasing agent and metallographer to assist them in the proper selection of supplies. To make inspection more practical, a swatch of each piece of material discussed is attached by the description. These samples permit a most convenient method of comparison for texture, grade, or grit. In addition to being valuable the booklet is well-prepared and attractive.
Circle Inform-A-Gram No. C10.

Publication "Air Power at Work," from Mead Specialties Co., Dept. NB-32 4114 N. Knox, Chicago 41, gives data on 39 bottle-neck breaking applications, which may well find parallels in your plant. In each instance a photograph of the project is given, backed by detail analysis of work sequence and equipment.
Circle Inform-A-Gram No. C11

Coordinated Carbide Tool Control. A Carboloy Co. planbook shows how the 'CCC' plan can be used to increase production and efficiency. How to standardize, conserve carbides, reduce rejects is also fully indicated. 28 pages, fully illustrated.
Circle Inform-A-Gram No. C12.

Booklet "Four Good Steps Toward Better Electroplating on Steel" gives thorough and valuable analysis to help you cut "those bad days" from your schedule. It's stimulating, should be of great interest. Oakite Products, Inc.
Circle Inform-A-Gram No. C13.

Advanced Barrel Finishing Brochure from Almco Div., Queen Stove Works, Inc., Albert Lea, Minn., presents new cost saving techniques in capsule form, complete with charts, photos, and diagrams. Full test and application data is included.
Circle Inform-A-Gram No. C14.

Apprentice Training, what it offers, the qualifications required, and where to apply for it is discussed in the revised pamphlet "Looking Ahead by Way of Apprenticeship" which is now available from Bureau of Apprenticeship.
Circle Inform-A-Gram No. C15.

There's a reason 71%*
of all popularly-priced Tool and Cutter Grinders sold in 1951 were "Knock-Outs"

MODEL B860

Will do anything that machines costing 2 or 3 times more will do . . . yes and in less time.

Distributed Only Through Franchise Dealers

K. O. LEE CO.
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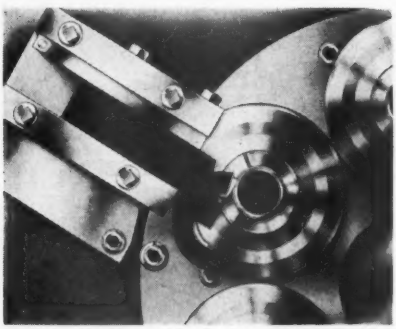
*SALES STATISTICS FURNISHED ON REQUEST

A Radically Different Cut-Off Tool

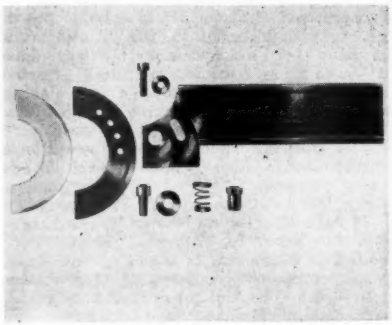
A circular cut-off tool based on a radically different concept of tool design is now offered to the metalworking trade. The tool fundamentally is a semi-circular disc of finest grade high speed steel, with the cutting surface in the periphery, similar to what would result were it possible to take a conventional straight cut-off tool and bend it into a half-round with its cutting edge on the outer diameter.

The blade is mounted in a holder as shown in the illustration, with all but the necessary cutting edge protected by an envelope or shroud. The tool is so ground that when the lead, or cutting edge of the tool, is in the same plane as the front of the holder, it is properly positioned. The tool holder is accurately located in the machine so that the cutting edge of the tool is in the spindle center line. The present holder can be substituted for the conventional straight blade holder in most screw machines up to 1⅝" capacity.



Photos courtesy Cir-Cut Division, The New Britain Machine Company.

In design, the profile of the Cir-Cut tool differs little from conventional blades. The top, or periphery, of the tool is hollow ground to callapse the chip and lessen heat generation from chip flow on the edges of the tool. Side clearances are ground in the blade during manufacture and remain constant throughout the life of the blade. The front clearance angle is ground in the blade prior to shipment and



to facilitate grinding guide lines are stamped on the sides of the blades. Top rake is constant—being built into the tool as it is resharpened. Control of chip during the cut is maintained by grinding the shroud, not the tool edge.

Since the tool will, in all probability, be installed on machines already in service, tool holder adapters have been designed to complement the tool holder assembly. These replace the present tool holder adapters and not only assure proper alignment with the spindle but permit a total of .090" height adjustment to correct for spindle variations. With the tool holder properly positioned on the adapter plate, there is little possibility of obtaining anything but flat cuts. Since the tool can be removed from holder and replaced accurately, it automatically holds center and size.

It appears from experience in the field that this new type of tool possesses five qualities which should be of value to any metal working concern.

A. Substitute for straight blades—no conversion problem.
B. Easy to remove and replace in machine—less down-time.
C. Requires no adjustment after grinding—fewer rejects for size variation.
D. Shroud permits minimum tool overhang—greater rigidity, flat cut, no chatter.
E. Thinner blades—major savings in material.

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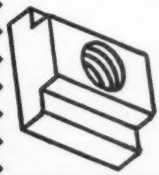
7428 S. Loomis Blvd., Chicago 36, Ill.



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Strap Clamps

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KIPP AIR GRINDERS
if you want to GRIND —not just rub!

MODEL JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind—not just rub. Every mechanic knows this, but inexperienced buyer may order tools that maintain proper grinding speeds only when running idle. The speed of Kipp air grinders drops but slightly when put to work. That means better work—longer wheel life.

Buy Kipp air tools for best results, lower prices.

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212 Waubesa St., Madison, Wis., U.S.A.

- *Skilled in* DIE CASTING *Mechanics*
- *Experienced in* LUBRICATION *Engineering*
- *Originators of Really High Speed* AIR TOOLS

Automatically Grinding Outside Diameters Concentric to Bores

Work pieces such as anti-friction bearing races or rings for precision mechanisms can now be OD ground within extremely close limits for concentricity. This is made possible by an entirely new method of work holding incorporated in a new concentric grinder.

This method reduces a large amount of the out of roundness which may be present in the bore, to produce roundness of the OD within closer limits than the bore. When grinding grooves or race-ways, parallelism with the face is assured within very close limits because of the work holding and driving method.

Although the primary application for this machine is in the bearng industry for grinding race-ways to super precision tolerances, there are many possibilities for its use in other types of manufacturing. Wherever concentricity, squareness, roundness and high production of ring-type parts with either flat or profile shapes is needed, this machine will grind parts having super precision quality with no increase in time over that ordinarily required to grind parts having only commercial tolerances.

The 16" diameter grinding wheel is driven from a 3 hp motor. Microsphere spindle bearings are used in both the wheel head and work head. Hydraulic rapid infeed and continuous hydraulic slow grinding feed are used to position and feed wheel during grinding cycle.

The new work holding principle utilizes a revolving face plate which is a permanent magnet. The work piece revolves about an arbor which has two wear resistant strips set in it lengthwise. In operation, the work arbor is moved to a position aside of, and near the center of the revolving face plate. The two wear resistant strips are spaced above and below the horizontal center line on the side of the bore nearest the grinding wheel. In effect, an internal V-type support is provided.

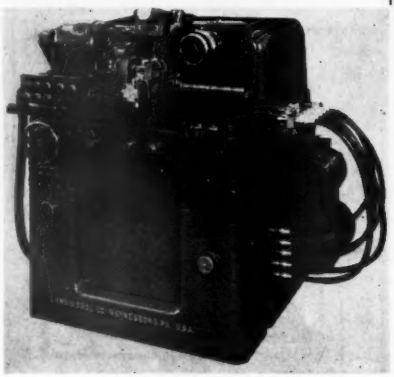

Photo courtesy Landis Tool Company.

An automatic loader is available which loads and unloads the work arbor, and also moves it into and away from grinding position. Hand or power operated wheel dressers, either straight or profile, are also available. The cycle is automatic so that it is possible for one operator to maintain a battery of machines.

Carboloy's Customer Training School

Six hundred classes have now been completed in Carboloy's Customer Training School which was started eleven years ago as the first attempt of its kind to explain, in detail, the uses of the then comparatively new carbides to members of the metal industry.

More than 5400 men and women in supervisory positions from approximately 1400 different companies have taken the five-day course in the plant of the Carboloy Department of General Electric Company in Detroit.

"Students"—representing all categories of the industry from corporation executives to men who use the carbides in the shop—came from forty states and thirteen foreign nations.

The foreign nations include: Canada, Brazil, Great Britain, Australia, Venezuela, Mexico, Argentina, Belgium, Norway, Spain, Sweden, France and Holland.

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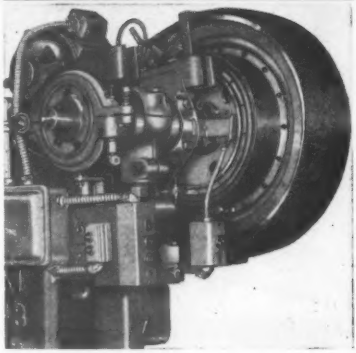

Here's the answer to more production — L&J Presses equipped with L&J-Fawick Air Clutches and variable speed drives. This unbeatable combination gives you more speed with greater safety through rapid, shock-free, full-power operation. Let us show you how these L&J Presses can speed-up your press work.

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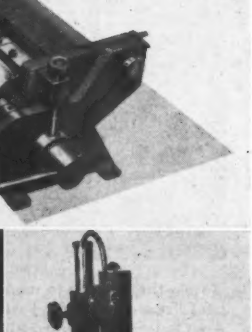
PROGRESS

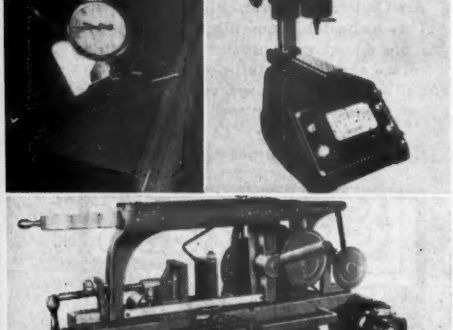
NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS

New Sheet Steel Separator permits instant removal of the top sheet of a stack, is designed by Clark-Hopkins Equipment Corp., 1124 Spring Garden St., Philadelphia 23, Pa. Separators may be used singly or in pairs, are now available in 6½", 9", 10", and 15" sizes. Possibility of feeding double sheets to the press is eliminated, feeding is speeded up, and risk of injury to the operator greatly reduced. Bulletin #T-2.
Circle Inform-A-Gram No. A1.

New 'Chicago' Bench Model Bending Brake. This equipment is bench mounted for operating ease, has capacity for any bending operation on sheet metal up to 18 gauge and 24" long. Bending edge is made up of fingers in graduated widths fitted to a bar, which may be adjusted or removed as work requires. The positive cam-action clamp is quickly adjustable for different materials thickness. Angularity of bend is controlled by adjustable stop assuring accuracy in duplicate work. Dries & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36, Ill.
Circle Inform-A-Gram No. A2.



Model B-1 'Flex-Tester', illustrated, provides a non-destructive method of testing sheet metal for drawing qualities and stretcher strain. It is used as illustrated to bend the corner of a sheet through a standard arc, measuring resistance on a dial indicator. The instrument can be used successfully on gauges up to .050". Research has shown that a Flex or "F" value in the low 50 range indicates the best of drawing quality. Full information may be had from Steel City Testing Machines, Inc., 8843 Livernois Ave., Detroit 4, Mich.
Circle Inform-A-Gram No. A3.



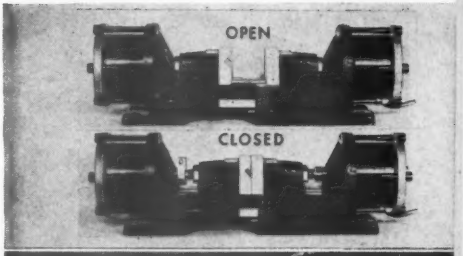
Four Gaging Ranges are provided by this electrical comparator recently developed by the Do ALL Company, Des Plaines, Ill. A simple flick of the switch provides the desired range. The operator may readily check parts on the range best suited for the tolerance involved. The electro-magnetic principle of magnifying the movement of the spindle tip is used, giving good stability for consistent readings and eliminating frictional moving parts in the gage head. Spindle pressure may be instantly set between four and forty ounces.
Circle Inform-A-Gram No. A4.

New 5 Hy-Duty Keller Power Hack Saw has increased capacity to nine inches by nine inches. It is provided with cabinet base, automatic lift on the reverse stroke, and foot lever to help hold frame in position while loading or unloading the saw or setting for desired material length. Pressure easily adjustable from 0 to 200 lbs. Sales Service Machine Tool Co., 2363 University Ave., St. Paul 4.
Circle Inform-A-Gram No. A5.

ON PARADE

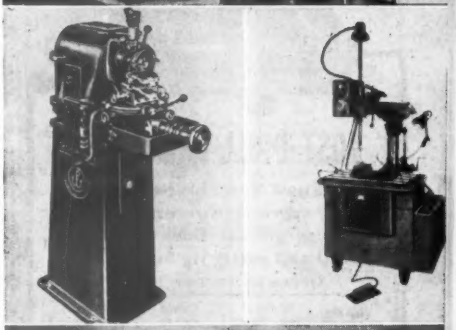
Mail FREE Inform-A-Gram Card for MORE Details.

New Black "Centr-Finder" Vise saves time and cuts cost of finding centers on runs of material regardless of shape. In operation, the jaw tolerance from the established center line is ± .001" at any dimension of jaw closing, within a working range of 0 to 4". The center of any workpiece within this range is brought within this tolerance both horizontally and vertically of the established center lines. Clamping pressures up to 2000 lbs. Black Drill Co., Inc., 1400 E. 222nd St., Cleveland, Ohio.
Circle Inform-A-Gram No. A6.

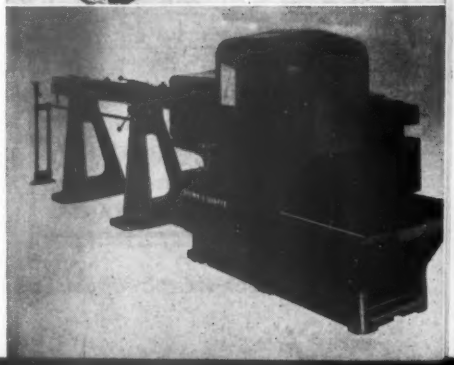


These Welded All-Steel Drawer Units may be bolted together in any of a score of combinations to fit almost any space. The units are completely enclosed, can be assembled to stand on the floor, in cabinets, on bench tops, or to be fastened to tool stands and desks. The units are available in three sizes: 14" wide by 15" long by 5" deep; 14" x 20" x 5"; and 20" x 20" x 6". A base, which comes in three sizes also to match drawer dimensions, is available. Standard Pressed Steel Co., Box 600, Jenkintown, Pa.
Circle Inform-A-Gram No. A7.

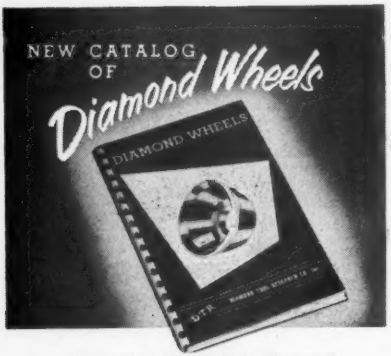
Wolters Carbide Tool Grinder has two concentric diamond wheels for rough and finish grinding. A lever slightly advances the outer wheel for the rough grind and retracts it so that the inner wheel projects for the finish grind. Only one set-up is required for both operations. The tool is clamped on a compound table that can be pre-set for all cutting angles and radii. Optical micrometer is built in for centering tool bit and checking nose radius. Cosa Corp., 405 Lexington Ave., N. Y. 17.
Circle Inform-A-Gram No. A8.



M-300 Electron Drill represents ultimate in arc machining process, will cut holes as small as .030", is adjustable for finishes ranging from coarse, fine, extra fine and super fine. Automatic power feed allows continuous operation, kills possibility of the electrode welding to the work. Any metal of any thickness may be easily worked, and square, hex, crescent, or any other desired hole shape may be cut. Elox Corp. of Michigan, 602 N. Rochester Rd., Clawson, Mich.
Circle Inform-A-Gram No. A9.



New Brown & Sharpe No. 4 Automatic Screw Machine assures continuous accurate production of medium-sized parts for cameras, automobiles, time fuses, and other defense items. A wide range of speeds and high-to-low speed ratios make possible the highest cutting efficiency on a wide variety of materials and work diameters. Full details available from Brown & Sharpe Mfg. Co., Providence 1.
Circle Inform-A-Gram No. A10.



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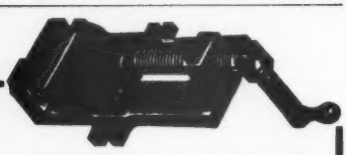

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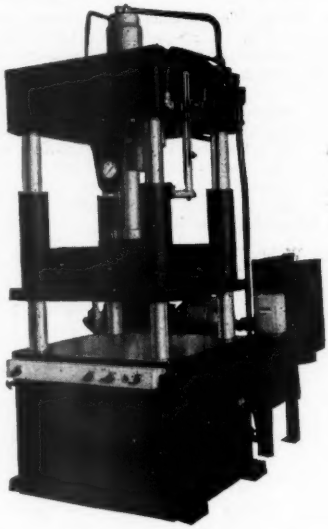
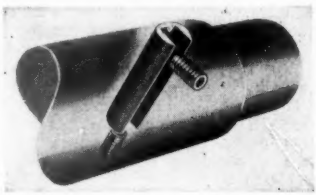


300 tons, each press having an adjustable pressure between ½ and full capacity during the curing cycle. The presses are electrically powered and hydraulically operated.

Circle Inform-A-Gram No. A11.

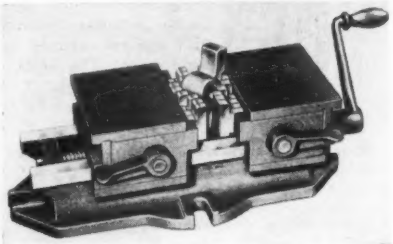
New Slotted Sleeve facilitates installation of tool bits. To install the sleeve in a boring bar, one hole the size of the sleeve is reamed part way through the bar and the sleeve held in



place by a pin. Two more holes are drilled and tapped; one to hold the tool in place and the other to provide back adjustment. May be used for square or rectangular tool bits. Further information from Novi Tool & Machine Co., 43043 Grand River Ave., Novi, Mich.

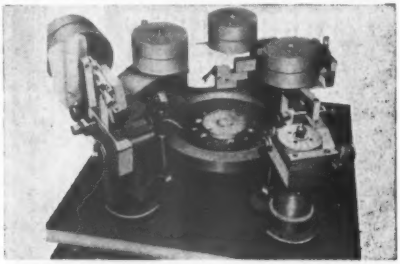
Circle Inform-A-Gram No. A12.

New "American Positive Grip Vise", by Connors and Davis Sales Corporation, Circuit Ave., West Springfield, Mass., is equipped with means for variable gripping, will hold all shapes and contours. Because jigs and fixtures may be eliminated, and because set-up time is cut, costs may be lowered on all types of machine tools. The vise is readily adaptable to



short-run production work, as the jaws re-center accurately on repeat holding operations. The vise boasts even pressure distribution to grip all contours of odd shaped pieces, and comes equipped with either serrated or plain jaws. Two mods. are available, max. open. 6⅛".
Circle Inform-A-Gram No. A13.

Multiple Head Tungsten Carbide Surface Grinder by the Spike Mfg. Co., 24609 Middlebelt Rd., Farmington, Mich., is designed for production grinding of solid carbide blanks. Produces a finish of 1 to 2.5 R.M.S. and gage block flatness, using a 150 grit diamond



wheel. Holds dimensions to plus or minus .0002". Due to a patented process, the wheel can be dressed and trued to .0005" in a few minutes. Longer wheel life is assured, reducing diamond cost from 20% to 50% per unit. The unique yet simplified operation eliminates complicated controls and specially skilled labor. Full data from manufacturer.
Circle Inform-A-Gram No. A14.

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WITH NEW 60° THREAD TRIANGLES
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Quickly checks all 60° standard and special threads from 4 to 56 pitch . . . ANY O.D. Perfect class 3 or 4 fit. No "fancy" calculations . . just add a constant to O.D. That's all.
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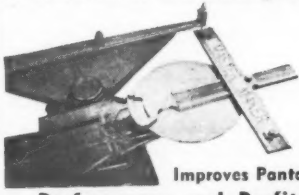

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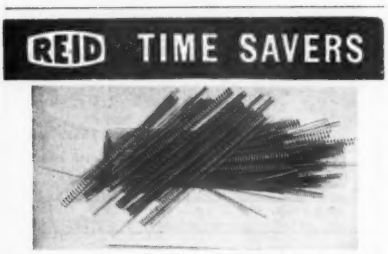
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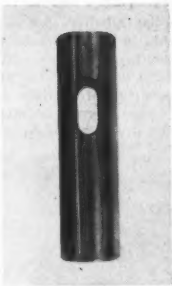
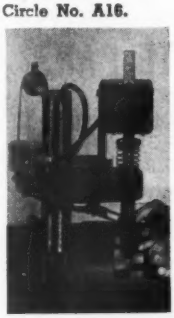


Stub Taper Turret Tool Holder of new sleeve type was recently announced by Scully-Jones & Co., 1913 So. Rockwell St., Chicago 8. It is designed for holding any tool with a standard stub taper shank, shortens overhang and assures simple but rigid set-up. The fitting is available for Nos. 2, 3, and 4 stub tapers.
Circle No. A15.

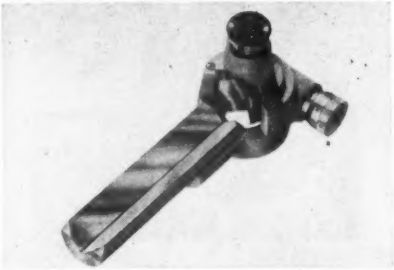
New Solid Carbide Cut-Off Tool for B & S automatic screw machines is announced by Gaylee Co., Clawson, Mich. The steel hub and carbide blade are brazed to form a permanently bonded unit. A special grind with two cutting edges permits cutting off with the top of the work coming or going. Ten standard sizes are stocked.
Circle No. A16.



"Electrostake", recently developed by Black & Webster, Inc., Dept. N.90 445 Watertown St., Newton 58, Mass., is solenoid powered, makes possible 25 to 50% production increase, provides complete operator safety. 3 models are available, largest can deliver a 3000 pound blow. Both hold-down pressure and staking blow are fully adjustable.
Circle No. A17.

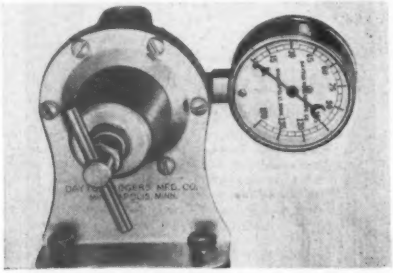
A Line of Cone-Drive Standard Bore Couplings for Cone-Drive worm, gear, and electric motor shafts is announced by Cone-Drive Gears Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12. Couplings are especially sealed for maximum protection and lubricant retention, are made in 22 bore sizes from ¾" to 6½" dia. with capacity from 4 to 550 hp.
Circle No. A18.

Optically Precise Gauge will inspect drill for equal lip length and angle grind in a matter of seconds. Both more accurate drilling and longer tool life are assured since points are concentric, reduce wear, require less grinding. Even slight differences may be easily detected. The error in angles is determined accurately by a micrometer barrel graduated in degrees.



Any included angle of point, up to 145°, may be measured, and any two lip drill, whether straight shank or taper, right or left hand, from No. 80 to one inch, can be gauged. Specially useful for checking unusual special-purpose angles. Full "Point-Chek" information from the F. T. Griswold Mfg. Co., Devon, Pa.
Circle Inform-A-Gram No. A19.

Reducing Regulator and Pressure Gauge for all compressed air purposes has recently been introduced by the Dayton Rogers Mfg. Co., Minneapolis 7, Minn. This unique, simple design is furnished in four sizes for ¼", ⅜", ½", and ¾" pipe connections. It will regulate all secondary pressures to 150 lbs. in a very satisfactory manner. The valve automatically reduces shop air line pressure to the lower desired pressure. The pressure gauge records at all times the primary pressure used or



wanted on the piece of equipment at the point of operation. The equipment is provided with special bracket and dampers eliminating concussion.
Circle Inform-A-Gram No. A20.

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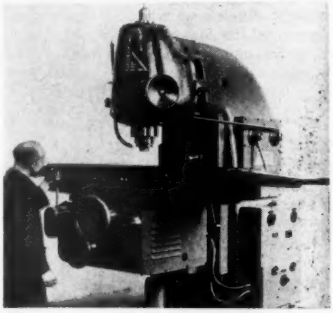
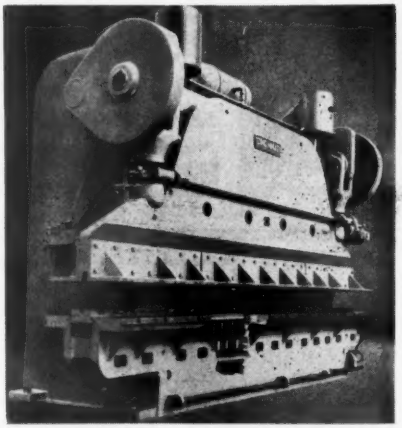


205 E. 42nd St., N. Y. 17. 12 spindle speeds and 24 feeds are provided, speeds engaged by magnetic clutches. Provision for automatic cycling and unusually rugged construction make these machines well suited to exacting production.

Circle Inform-A-Gram No. A21.

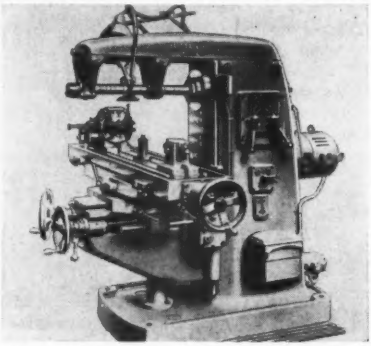
This Cincinnati All-Steel Press Brake can be used for shallow draw work as well as conventional press brake work. It has a double plate bed, 30" wide, and 15'8" in overall length. 14 six-inch air cylinders are mounted between plates for operating draw rings,



knockout bars, and similar units. Removable ram angles for press or brake ops., 23 strokes per min. Air counterbalances and horns on each end of bed and ram. Cincinnati Shaper Co., Hopple, Garrard & Elam Sts., Cincinnati.

Circle Inform-A-Gram No. A22.

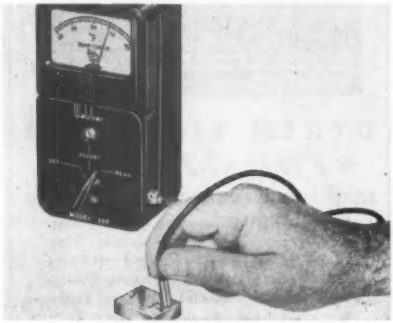
Jaspar Milling Machine. as illustrated, is made in a range of vertical and universal models in No. 2 and No. 3 sizes. In both instances the universal type has been designed



to incorporate climb-milling attachments. Tables and machine are designed to withstand maximum speeds of tungsten carbide cutters. Machines are equipped with main drive motors for the spindle and a separate motor for actuating table feed. Full data available from Morey Machinery Co., 410 Broome St., New York 12, N. Y.

Circle Inform-A-Gram No. A23.

Webber Temp-Chek Useful Accessory in Precision Measurement. Variables in temperature affecting tolerance in high precision measurement are quickly checked by this device from the Webber Gage Co., Cleveland, Ohio. It provides a rapid method of reading temperature of metals, liquids, or air within its range.



The standard model is calibrated from 60 to 100° F., and the reading obtained by placing the probe on the object to be measured. The device is completely portable and about as large as a snapshot camera. Dial readings can be checked and calibrated.

Circle Inform-A-Gram No. A24.

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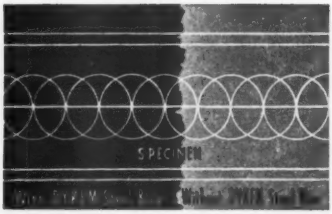

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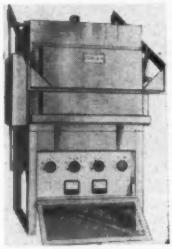
New Model 150 Deep Throat Power Punch Press from Whitney Metal Tool Co., Rockford, Ill., has 24" throat and 2" stroke, is equipped with releaseable non-repeat clutch. Capacity is 10 tons at 175 strokes per min. 5 ton safety factor.

Circle No. A25.



High Speed Tool Steel Heat Treating Furnaces, by Cooley Electric Mfg. Corp., 38 S. Shelby St., Indianapolis 7, Ind., come in three models with operating temperatures between 1650° F and 2500° F. Largest chamber size 12" x 8" x 24". Catalog now available to all.

Circle No. A26.

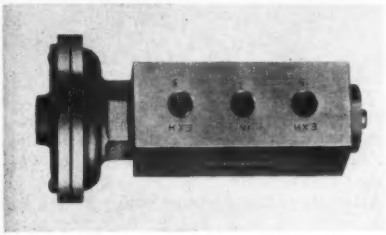
Adjustable Table and Headstock are features of a new Alfing heavy-duty drill press now distributed by Kurt Orban Co., Inc., 205 E. 42nd St., N. Y. 17. Capacity is 1" in steel and 1¼" in cast iron; work table 26" x 28"; 9" spindle stroke; 8 spindle speeds; hand or power feed; automatic return. Full data available from distributor.

Circle No. A27.

Two New Power Operated Punch Presses have just been added to the line made by O'Neil-Irwin Mfg. Co., 626 Eighth Ave., Lake City, Minn. Both will punch a hole 4" dia. in 16 gauge sheet or a ⅜" hole in 3/16" steel plate. Machines have deep throat design. Features include 180 strokes per min., foot control, quick set-up, compactness, and portability. A material chute is built into cabinet for delivery of slugs and blanked parts. Full data from maker.

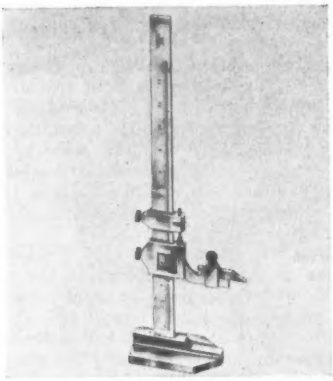
Circle No. A28.

New "Quick-As-Wink" Diaphragm operated spring return single plunger valve illustrated will operate on as little as 12 to 35 psi, is consequently well suited for use in research and development labs., as well as commercial applications where only low pressure is available. The valve is low priced, and was recently introduced by C. B. Hunt & Son, Inc.,



Salem, Ohio. Construction is sturdy, design very simple, and operation extremely free. All parts are carefully balanced. Valve housing is in aluminum, and stainless steel plunger is hollow with precision placed radial ports. The spring return is placed under the diaphragm push plate permitting open end exhaust. The improved design prolongs the life of packing and valve parts, reducing repairs and maintenance to the minimum.
Circle Inform-A-Gram No. A29.

New Starret Vernier Height Gage has full 12" range, has just been added to the line of #454 gages by L. S. Starret Company, Athol, Mass.,



with a fine ground finish on all surfaces. The bottom of the base and the scriber are hardened and lapped and the bar is hardened with machine divided graduations. Scriber is easily removable for sharpening or attachment fitting.
Circle Inform-A-Gram No. A30.

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Weldment to Stamping

The weldment part, shown at A in both illustrations, was originally designed to be made from two pieces of cold drawn steel.

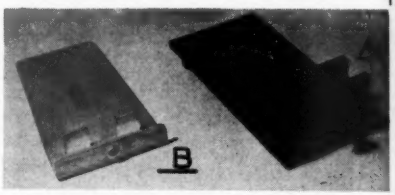
The base section, A-1 was made from a ¼" x 6¼" x 3½" piece with two drilled and tapped holes in the right end section.

For the top section, A-2, a 1¼" x 1¼" piece was used. A slot ¾" wide by ⅝" deep was milled through the entire length of this section. In addition to this, there was a hole drilled and tapped to take a ⅜" screw.

These two pieces were then welded together as shown at A to make the part.

The net overall cost for producing this part was $7.50 each in lots of 100.

A re-design of the part called for it to be made by stamping from ⅛" steel as shown at B. The two formed ears were developed by opening a slot around these formed sections in the base part. The slot

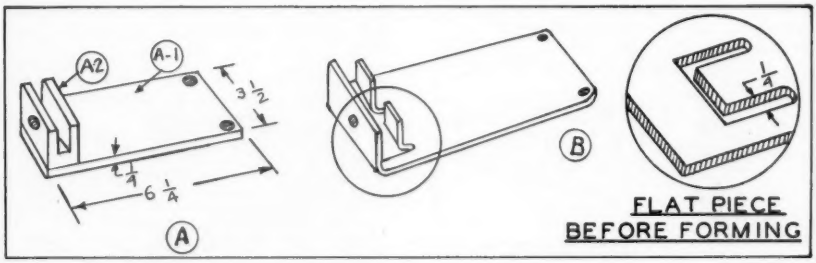


Illustrations courtesy Dayton Rogers Mfg. Co.

openings were twice the thickness of the stock, thus allowing the punches to operate satisfactorily.

After blanking, piercing and forming to size, as shown at B, the ⅜" hole was tapped in the bent up leg and the two ¼" holes were tapped in the base.

The cost of producing the part by stamping was $1.35 each, with tool amortization on the first order, as against $7.50 each by the former method.



Help Wanted

The Pressed Metal Institute needs your assistance in accumulating a library of information on safety devices for presses and other related equipment.

This information will be used to set up a library to aid PMI's Safety Committee and will also be used to inform members on specific safety devices when such inquiries are received. The information will later be used by a subcommittee of PMI's Safety Committee which will be charged with the study of various types of safety equipment.

All producers of equipment and devices having application in a pressed metal fabricating shop are invited to submit full data regarding their products.

Data should include a clear description of the safety feature or features and if possible a glossy photograph of the unit or device, and any other factors dealing with efficiency and low maintenance.

The Institute's headquarters are at 2860 East 130th St., Cleveland 20, Ohio.

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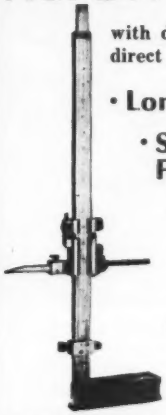

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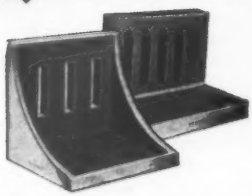

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#200	3.25	3½"	3"	2½"	....	....
#201	4.25	4½"	3½"	3"	#301	$5.50
#202	5.50	6"	5"	4½"	#302	7.75
#203	7.00	7"	5½"	4½"	#303	8.25
#204	9.00	8"	6"	5"	#304	11.50
#205	11.50	9"	7"	6"	#305	14.50
#206	17.00	10"	8"	6"	#306	18.50
#207	22.00	12"	9"	8"	#307	24.00

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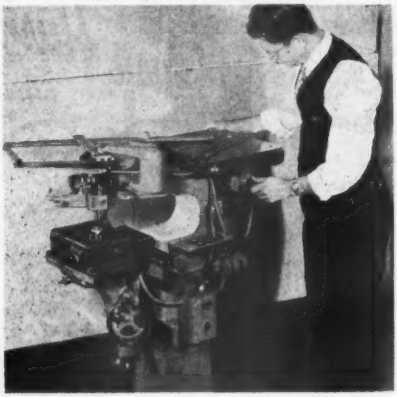
. . . Pantography, from page 86



Figs. 11-12. Automatic arrangement on a standard pantograph for profiling buckets or blades such as shown at right.

apparently baffling problems to its users which have resulted in a skeptical attitude in the minds of a few. Close adherence to the manufacturer's instructions and familiarity with the characteristics of the pantograph, however, have made possible enormous savings in production time and costs.

Another advantage in pantography is that exacting work can be done by relatively inexperienced operators. As an example, an operator of little or no experience or skill in diemaking can do a better job faster than a highly skilled diemaker can accomplish by any other method. Short runs can be economically handled by pantography because masters can be so easily and simply constructed. For long runs, more durable masters are used and, in many cases, the pantograph can be converted to semi or completely automatic operation, Figures 11 and 12. In cases like the latter, one operator can tend several machines at a time.

Briefly stated, pantography adds precision and increases production at minimum cost in many of the following operations when working ferrous or non-ferrous metals as well as with plastics and other newly developed materials: profiling, routing, diesinking, mold cutting, counterboring, chamfering, machining, drilling, grooving, graduating, slotting, engraving and calibrating—in all cases where the workpiece is either flat, uniformly curved, cylindrical, spherical, or irregular in shape—either two-dimensional areas or three-dimensional solids.

The pantograph can be used to reduce, enlarge, reverse, or invert, either at a 1:1 ratio or at any ratio within the limits of the machine. These operations are likewise exclusive to pantography, Figure 13.

There is one more unusual advantage of the pantograph method which should be mentioned. This advantage results from the fact that the pantograph principle, on the one hand, can be readily adapted to varying requirements and, on the other hand, the reduction ratio can be employed for certain classes or work without the pantograph mechanism, Figure 14.

Adaptations of Pantograph

In addition, there are several successful variations or adaptations of pantography in use today which may not be too generally known or recognized:

Form Grinding. The pantograph principle has become valuable in dressing grinding wheels to various shapes and forms where the finished metal workpieces must be form ground to very accurate limits and with exceptionally high surface finishes. The pantographs used for this work are not "general purpose" machines, but are

(Continued on page 188)

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. . . Pantography, from page 186

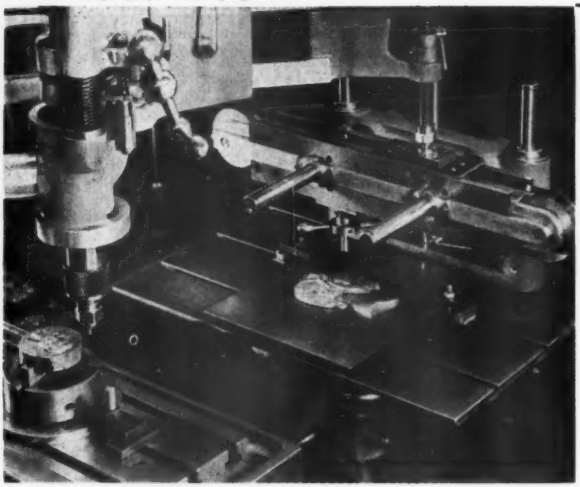


Fig. 13. Reversing attachment for three-dimensional pantograph. Note the position and recessed detail of the master, at left, and the position and detail in relief of the work, at right.

usually designed for this type of work only. They, therefore, feature refinements over and above what are required on so-called standard machines.

Torch Cutting. For some time, the conventional pantograph mechanism has been employed in sheet metal cutting. Metal sheets, either single or multiple, of almost any thickness can be cut with oxygen torches to various shapes more satisfactorily than by sawing or milling.

Map Reproduction. While this article has been confined to a general discussion of the pantograph **machine,** it might be well to mention the fact that the origin of the machine stems from the simple pantograph drawing instrument familiar to all engineers and draftsmen. A development half-way in between the drawing instrument and the machine is a special purpose pantograph which is used to transfer contour lines from a flat map to actual relief contours on a relief map.

Pantography Today and Tomorrow

It is easy to understand from the foregoing that the standard pantograph is one of the most versatile machine tools of our time and that it is susceptible to more successful special purpose and multi-purpose variations to meet specific requirements than perhaps any other mechanical device known to modern industry.

After 50 years of serving the broad field of manufacturing in a limited but expanding capacity, the pantograph today is just beginning to come into its own as a highly accurate machine tool which can be put to many uses to help increase America's productivity.

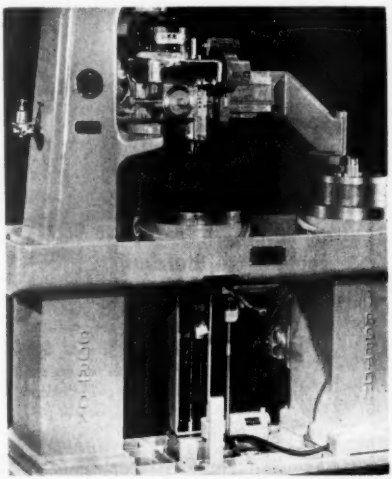
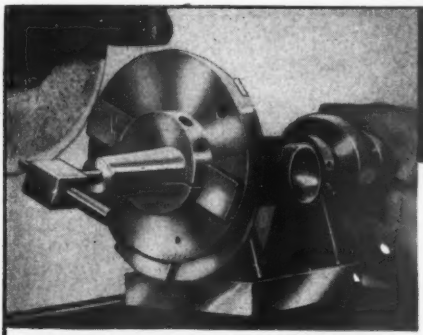


Fig. 14. Special cam contour mill for breech blocks for aircraft cannon. The beam construction eliminates the pantograph and increases accuracy and rigidity.



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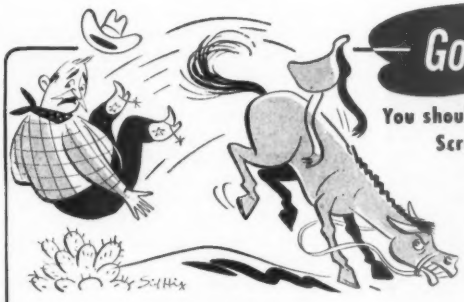

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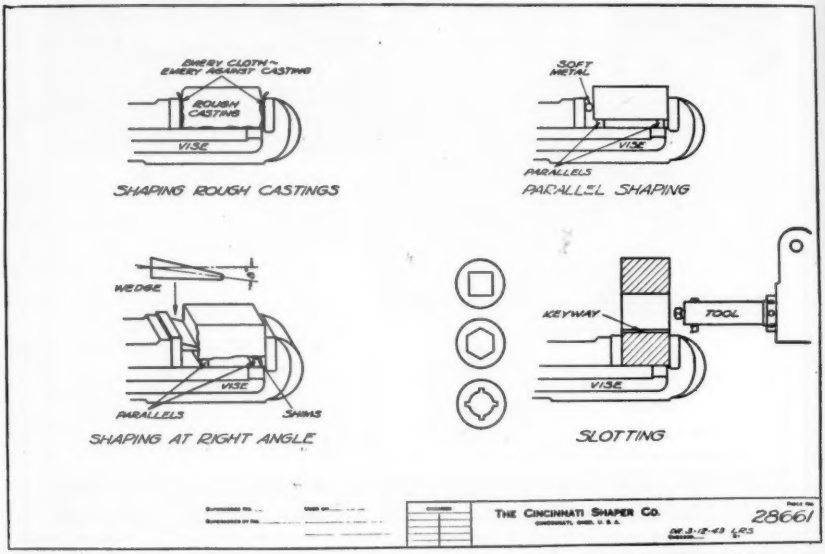
. . . Shapers, from page 100



Drawing courtesy Cincinnati Shaper Co.

Work-holding techniques employed for shaping rough castings, parallel shaping, shaping at right angles and slotting.

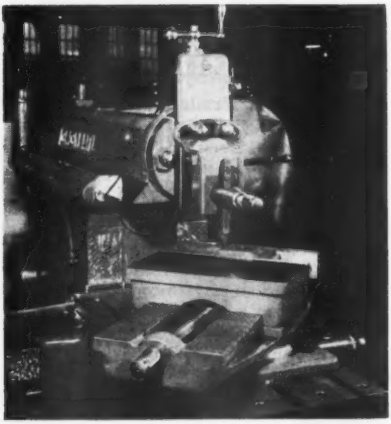


Photo courtesy Cincinnati Shaper Co.

A powerful shaper vise of the swivel base type is shown holding a workpiece and swiveled approximately 45 degrees.

some instances, special adaptations have been made of standard machines on specific jobs. As a case in point, a shaper has been made portable, in the sense of making it adaptable for handling with a crane, so that it can be set on or into large weldments, for planing recesses or making specially-shaped cuts where they may be needed. In one instance, a portable crane-handled shaper was built which could be set into or on gun-mount weldments for planing recesses.

Vertical shapers handle an entirely different range of work from that handled on other types of shaping machines. They cut all sorts of irregular shapes, and often do it without a single time-killing change in the set-up. Such a machine enables any good machinist to finish many special jobs, and do it very quickly. While a vertical shaper resembles an ordinary slotter, it is not subject to limitations of the slotter. While it makes use of the simple, flexible, work-holding and work-adjusting features of a slotter, it also

(Continued on page 192)

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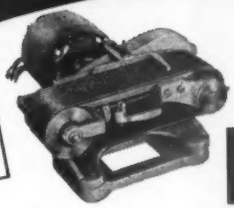

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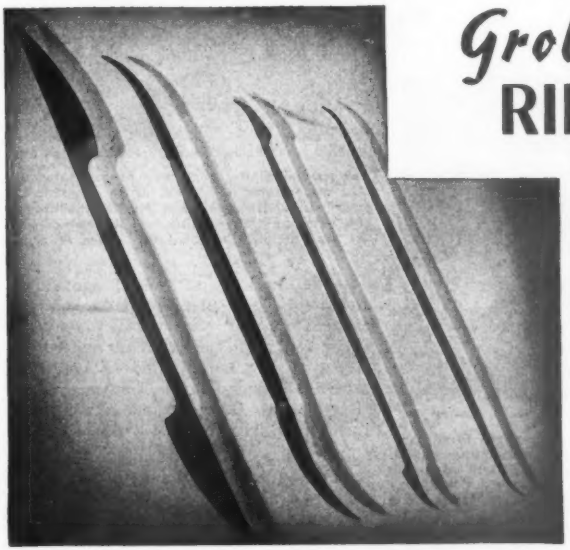
Industry News

William O. Staubitz has been named Assistant Sales Manager of Columbia Machinery and Engineering Corp. of Hamilton, Ohio. He was recently associated with The General Electric Co. of Lockland, Ohio, where he served as machine tool coordinator with the sub-contract Department of the Jet Engine Division.

Columbia recently acquired The Bridgeport Grinder Company and the Diamond Safety Emery Co. of Bridgeport, Conn.

Morse Chain Company, a Borg-Warner Industry has recently appointed **Walter C. Bass as** Manager of their Ithaca Branch Sales Office and **C. H. Erbacher** as Manager of their Detroit Branch Sales Office. These men will administer the sales of all Morse mechanical power transmission products in their respective territories.



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. . . Shapers, from page 190

Photo courtesy Western Machine Tool Works.

This shaper has a 24" ram stroke. It is a back-geared, heavy duty machine, having 8 ram speeds, and 7 power feeds, horizontal and vertical. Lubrication is of forced feed type. Timken roller bearings are used throughout.

incorporates the refinements of a non-over-hanging tool head, and of smoother ram motion.

Cutting pressures are taken directly on the table and on the solid bed of the machine. There is no springing of the table, such as may possibly occur with a horizontal shaper. Such cutting pressure and working action tends to hold the knee and slides of the machine together, thus eliminating play. Such machines usually incorporate longitudinal and traverse feed of both hand and power type. There is the additional advantage of rotary feed to the table, either by hand or by power. This combination of features permits very easy machining of circular, convex, concave, and irregularly-shaped work of all kinds, without use of special fixtures which would be necessary if the same work was to be done on a horizontal shaper.

Photo courtesy L. S. Starrett Co.

The time required for a shaper operator to adjust for the depth of the first cut is sufficiently great by ordinary methods so that it definitely pays to employ a special gage for the purpose. The gage shown reduces to a minimum the cut and try method common in some shops. This gage has a level in its base, which is a worthwhile feature in itself.

Progress of Work Plainly Seen

When using a vertical shaper, very close observation of the work is possible. Where a horizontal shaper is employed, the tool leaves the work on the guide line. Chips break out at the guide line, tending to deface the line, and to introduce error. Where a vertical shaper is used, the tool enters at the guide line. It is therefore no trouble to keep it precisely on the line all the while. Vertical shapers are used in a wide variety of metal working industries. They are found in many tool rooms, shaping out special fixtures and tools required for almost every manufacturing process. In die shops, railroad repair shops, general repair shops and many other places, such machines are quite regularly found.

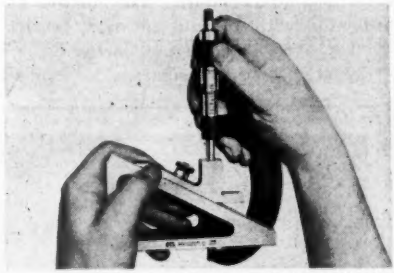

Photo courtesy Brown & Sharpe Mfg. Co.

The special shaper gage may be preliminarily set to a micrometer as shown, or to a surface gage, after which, by setting it on the machine table and bringing the machine tool in contact with it, the first cut may be absolutely relied upon.

Internal splining of hubbed gear blanks, various types of slotting, facing of castings, and all sorts of difficult cuts found in repair shops and tool rooms are han-

(Continued on page 194)

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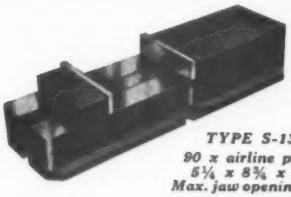

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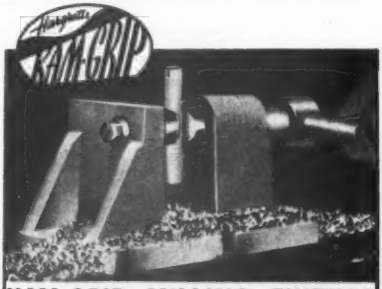
Industry News

At the Annual Meeting of the Grinding Wheel Institute, Atlantic City, New Jersey, **Earl C. Hughes,** Vice-president of Bay State Abrasive Products Co. was elected chairman of the board of directors. He succeeds **George F. Kohn,** president of Precision Grinding Wheel Co., Philadelphia.

H. Paul Floyd, vice-president of Waltham Grinding Wheel Co., Waltham, Mass., was re-elected president of the Institute, and **Clarence E. Etheridge,** secretary of Macklin Company, Jackson, Mich. was re-elected vice-president.

The Grinding Wheel Institute three day meeting was attended by over 100 executives from grinding wheel and abrasive manufacturers from all over the nation.

Standard Pressed Steel Co., Jenkintown, Pa., is now selling work benches by the mile. The company has an order from the Air Force at Wright Field for two and quarter miles of benches, 2000 of them. These benches, made under the brand name Hallawell, are all steel, measure six feet long by 30 inches wide, weigh 275 pounds each and have a center draw. The benches can be used as continuous benching or individual work stations.



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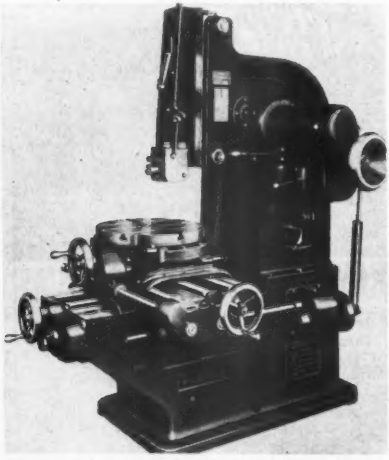
. . . Shapers, from page 192

dled readily on a suitable vertical shaper. Use of jigs and fixtures is wide spread, and is constantly increasing. Vertical shapers lend themselves readily for machining the multiplicity of shapes necessary for such jigs and fixtures.

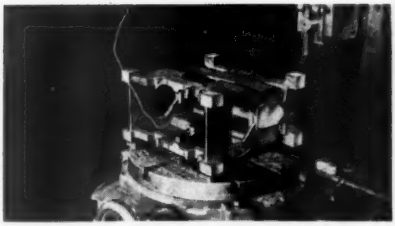
Some of these machines incorporate an angular adjustment for the ram, by means of which relief on dies can be directly machined. This is a particular and important advantage in the die shop. As arranged on one outstanding machine, the ram slide and ram form a separate unit on the front of the machine



Photos on this page courtesy Pratt & Whitney Division, Niles-Bement-Pond Co.

This vertical shaper has four different speeds on the ram. Machines of this type are made in two sizes having a 6″ and 12″ maximum stroke, respectively. Stroke in either case may be adjusted from zero to maximum, and an angular adjustment of the ram may be made from zero to 5 degrees.

column. The slide is provided with a very heavy hinge at the top, and with a heavy screw adjustment at the bottom. This arrangement allows the entire ram to be swung to any desired angle up to 5 degrees from vertical, and solidly locked in position. An angular scale is provided for setting the ram accurately, and a stop allows it to be returned to true vertical position without adjustment, whenever desired.



All surfaces in a box jig must usually be machined accurately, and in correct relation to one another. The 35 surfaces and slots of irregular shape in this particular box jig were machined on a vertical shaper without a change in setting.

In railroad repair shops, vertical shapers are often kept in almost continuous use, because they lend themselves so well to many odd jobs of machining in railroad repair work. Journal boxes, pins, links, rods, quadrants, and other parts are readily machined, generally without need of special fixtures. While many of the work pieces handled are attached directly to the table, both vises and angle irons are available for bolting to the table, and are used as necessary. One leading manufacturer of vertical shapers also provides a table index plate attachment for use on some of his machines.

Draw-Cut Shapers

Another type of shaper much used in railroad shops, along with special railroad shapers, is the draw-cut shaper. Such shapers receive various types of attachments, and relieve the special railroad shaper for use on work for which it is

(Continued on page 197)

This illustration shows a die consisting of a die set, die shoe, punch, and stripper. It is of intricate outline and has many sharp corners. This job was produced on a Pratt & Whitney vertical shaper without difficulty, and saved 55½ hours or 75% over previous methods.

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INDUSTRY NEWS

A. M. Cox, President of Pittsburgh Commercial Heat Treating Company, Pittsburgh, Pa. has been elected President of the Metal Treating Institute.

A. N. Abelson has been appointed Vice President in charge of Manufacturing of the Aro Equipment Corp., Bryan, Ohio by Aro's Board of Directors.

James T. Duffy, Jr., formerly president of The Riverside Metal Company has been elected Vice President of the Camden Forge Company, Camden, N. J.

Emery B. Kerekes was named assistant to the vice-president of Hydropress and its subsidiary, The Loewy Construction Company, Inc. of New York. Mr. Kerekes has long been associated with leading industrial concerns in management, development engineering and plant operations.

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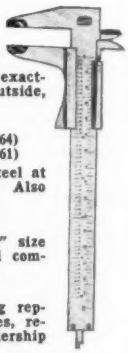

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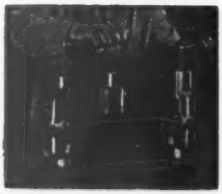

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. . . Shapers, from page 194

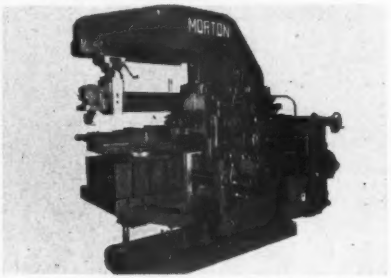

Photo courtesy Morton Mfg. Co.

Shown here is a 32" stroke, high duty draw-cut shaper, provided with an overhead ram support. Such support eliminates ram deflection. This is a highly efficient machine for shaping large die blocks.

particularly adapted. Draw-cut shapers are heavy-duty machines. One machine of this kind has a 42" stroke, and is used extensively for shaping die blocks. Another, designed more particularly for use on large locomotive parts, has a 60" stroke and incorporates a 60" horizontal feed. Frame cross-ties, guides and guide yokes, guide yoke braces to cylinders, link fulcrums, frame cross-ties at main pedestal, brake cylinder and waist sheet cross-tie, frame cross-tie and valve motion bearer, and many other large locomotive parts are machined economically on shapers of this type.

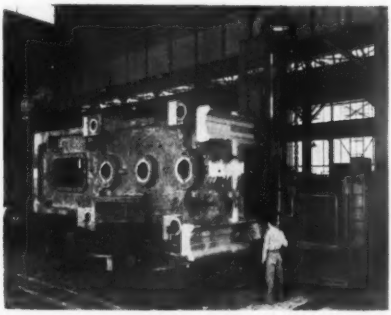

Photo courtesy Mesta Machine Co.

This exceedingly large draw-cut shaper is shown machining a universal slabbing mill housing. The cut being made can be clearly seen. Stroke of the ram is 120", ram cutting speed is 15 to 30 feet per minute, and the return speed of the ram is 30 to 60 feet per minute.

There are, however, draw-cut shapers far larger than this. One machine observed has a ram stroke of 120". The lowest position of the ram from the floor is 2' 10" to the center line, and the highest position of the ram from the floor is 15' 1" to the center line. This machine has a cutting speed of from 15 to 30' per minute, and a return speed on the ram of 30 to 60' per minute. Draw-cut shapers are also manufactured, in some cases, as combination shaping, boring and milling machines. Necessary parts for change over for boring include a face plate, spindle, feed mechanism, and an outboard bearing for supporting the boring bar.

Photo courtesy Onsrud Machine Works.

A two revolving table shaper for edging non-ferrous metal parts.

Automatic Edge Shapers For Non-Ferrous Parts

High speed automatic shapers of a general type used in the woodworking industries have been perfectly adapted for use in high speed edge shaping of aluminum and other non-ferrous metal parts. These machines have a dual table construction which permits practically continuous production. The operator loads and unloads one table while work on the other table is being edge-shaped. High speed rotary cutter heads are employed, so the operation is akin to milling, although work produced is actually edge-shaped.

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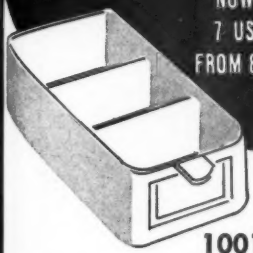

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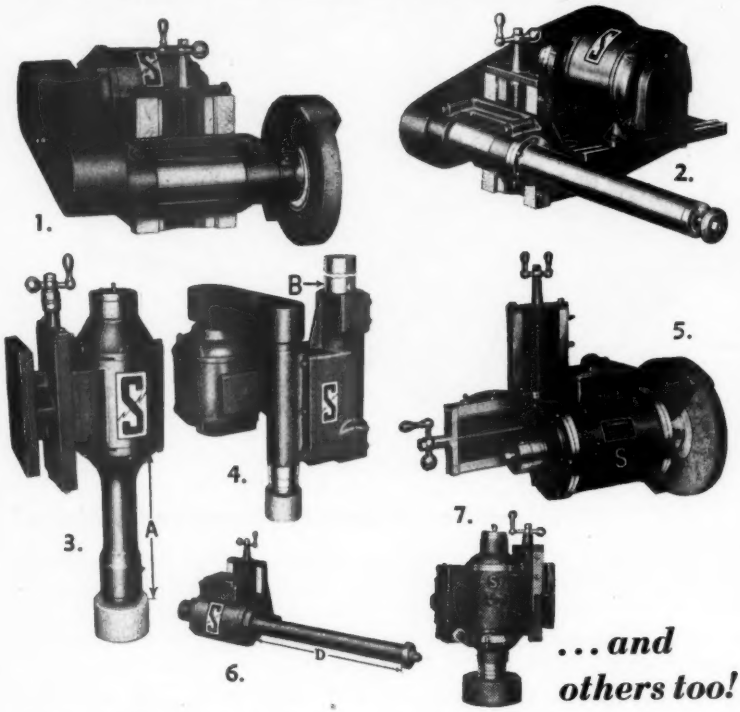

1. Belt Driven Lathe Grinder ¼ H.P., to 20 H.P.
2. Belt Driven Internal Grinder. Grind up to 24" deep. ¼ to 3 H.P.
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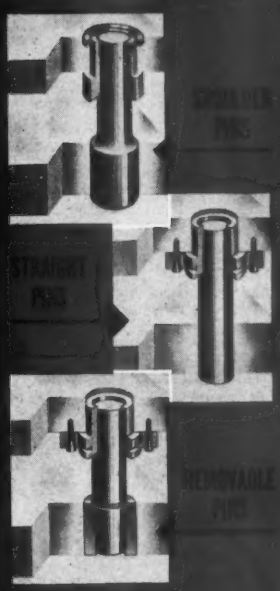

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